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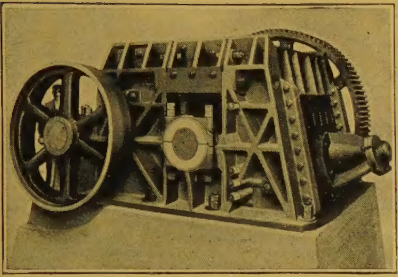

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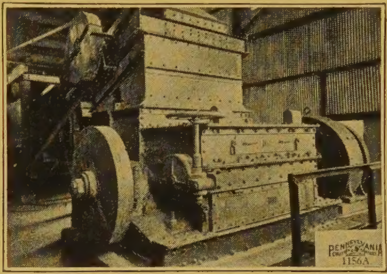

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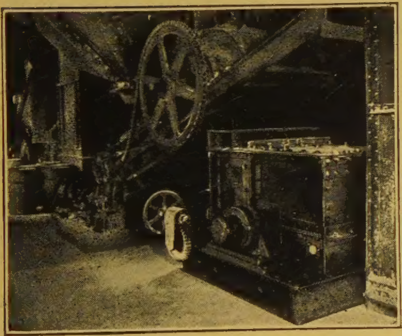

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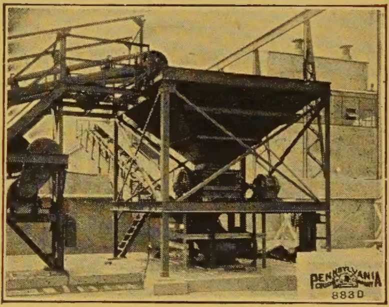

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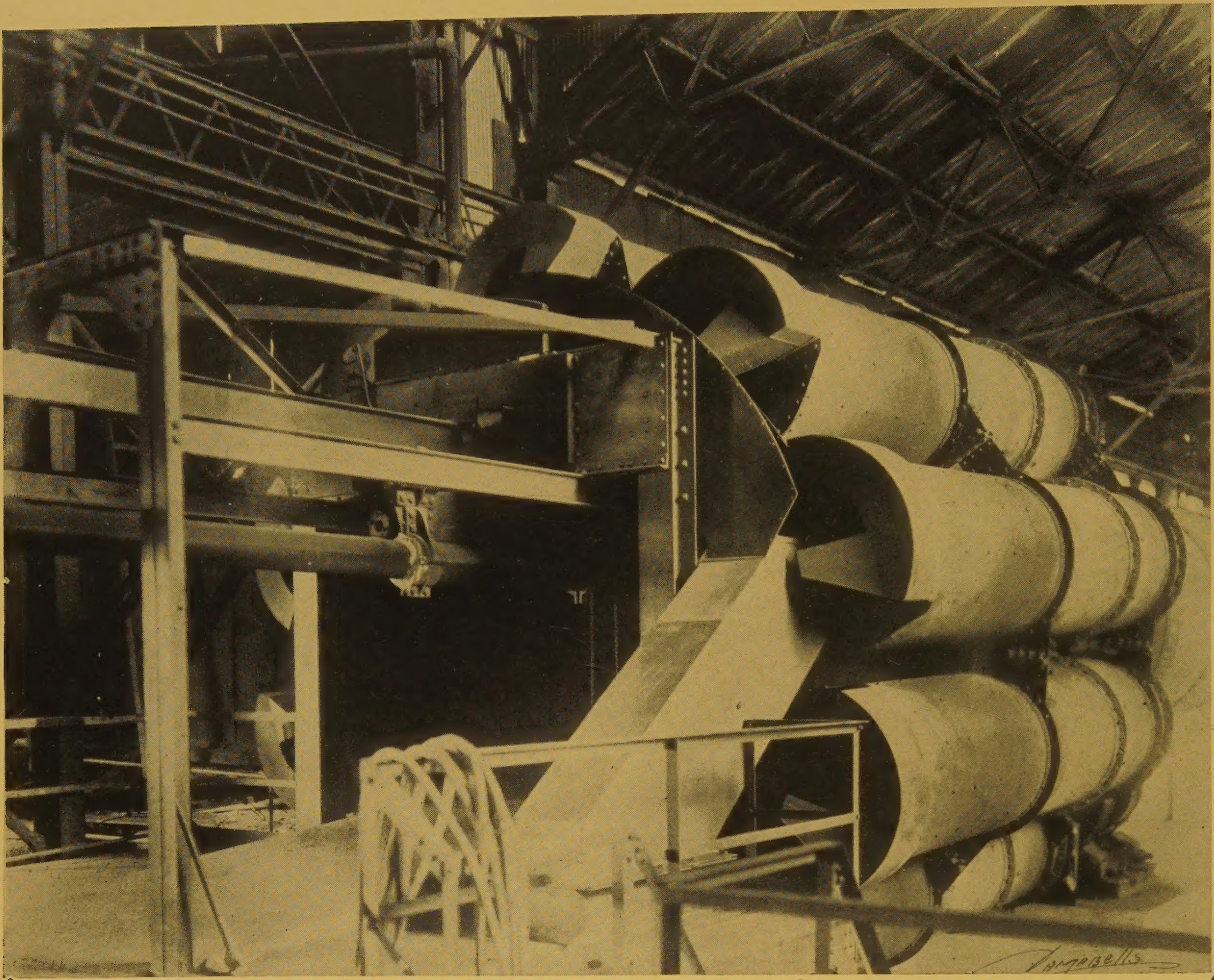

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The Cement Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition. The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

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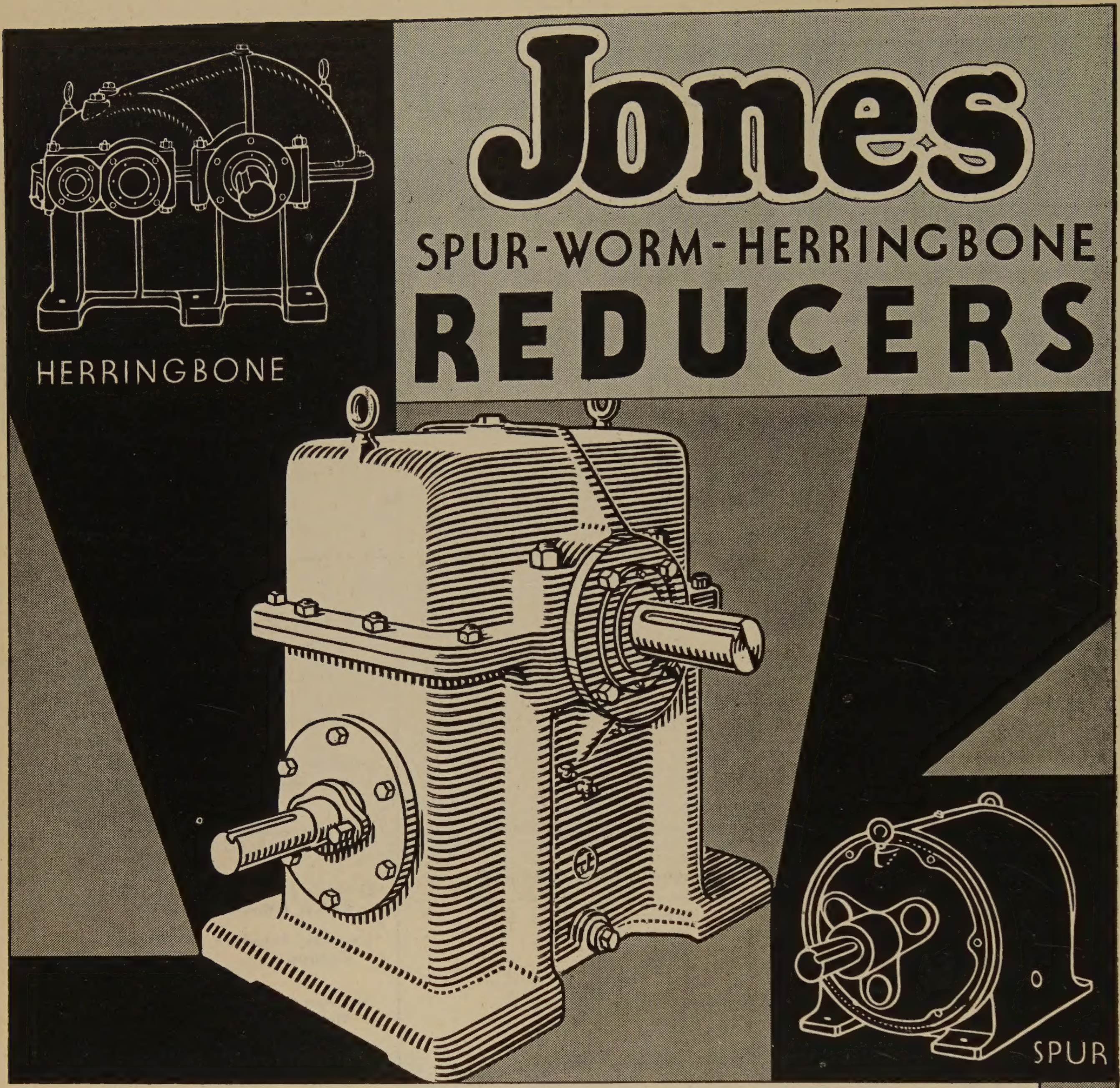

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MILL SECTION of

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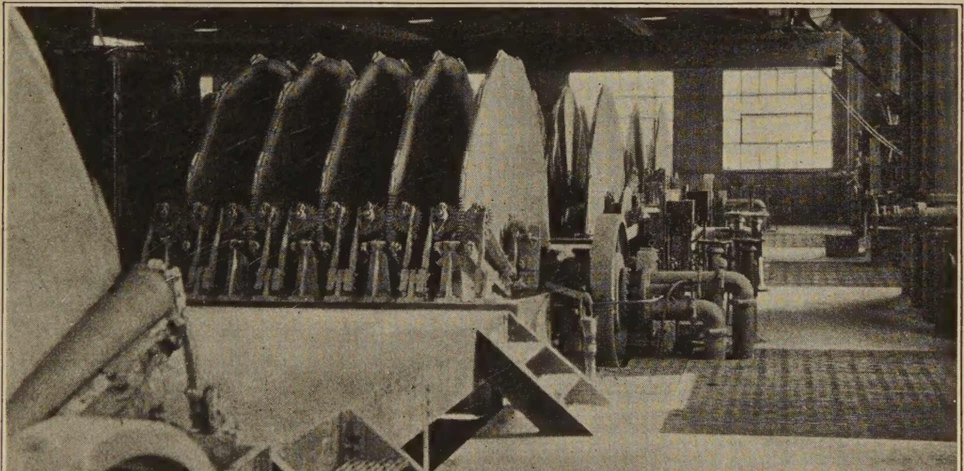
Vol. 36 Chicago, March, 1930 No. 3

Filters in Wet Process Cement Plants Save Fuel

Three Ways to Save Fuel in Burning of Clinkers—Filters Reduce Water Content of Slurries—Less Fuel Required for Drying Filter Cakes—Disc and Drum Types—Seventeen Plants Now Equipped with Filters

By H. A. SCHAFFER

IN the manufacture of cement by the wet process, fuel economy has been accomplished in the past few years by several different methods, among which are, first, the utilization of the heat in kiln exit gases for the generation of steam in waste heat boilers. Second, the installation of long kilns, 250 to 343 ft., in a number of new plants. These same long kilns have supplanted or are operated in conjunction with older and shorter equipment in existing plants. Kilns measuring 11 ft. 3 in. by 10 ft. by 343 ft. are reported to be using less than 100 lbs. of coal of 12,500 B.t.u. value, when burning slurry containing 34 per cent of water.



Another disc filter installation for limestone-clay slurry

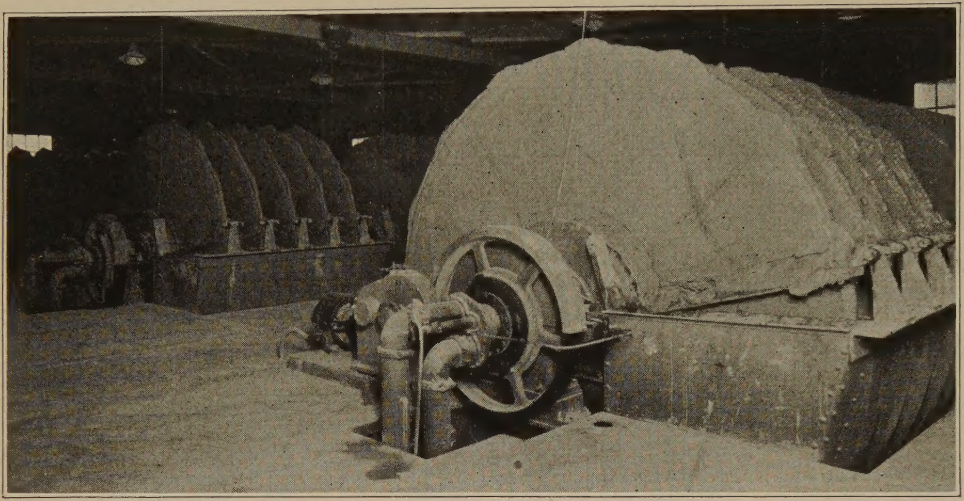
Filters Reduce Water Content of Slurries

Third, the other outstanding change which has resulted in the saving of fuel in the wet process, was the introduction of filters for the removal of a portion of the water content of slurries. This process has been generally applied to wet kilns of medium length (up to 240 ft. long), many of which are connected to waste heat boilers, and it reduces the slurry to a moistened cake containing in most cases about one-half of the original percentage of moisture when fed to the kiln.

The rapid drying of the filter cake, on entering the kiln, speeds up the material for the calcining and subsequent clinkering zones. Less water to expel reduces fuel consumption; acceleration of the drying process thus increases burning efficiency over the entire length of kiln and results in increased clinker output. Against these gross savings must be deducted the cost of operating the filters, including interest on the added capital investment, depreciation, and related items. However, the net saving in using filters by those companies having a slurry which can be successfully filtered is quite considerable. The last statement must be stressed, since some slurries are more or less colloidal in structure and the presence of organic matter and other substances clogs the filter cloth and results only in the partial dewatering of such slurries.

Filtration Tests Necessary

Hence it is necessary to conduct laboratory filtration tests of all raw materials to ascertain these properties and to determine the size and square feet of filter capable of supplying feed equivalent to a certain kiln production before making a permanent installation.



Typical disc type filter installation for limestone-clay slurry

Disc and Drum Type Filters

There are two distinct types of filters which have been installed in the cement plants of this country. They are known as disc and drum filters. The disc type is installed in fourteen plants, though drum filters are now successfully handling slurry in three plants where standard raw materials such as limestone and clay or limestone and shale are used.

The first filter installation in a cement plant in this country was employed on a slurry where the clay constituents are obtained from blast-furnace slag. The original slurry was difficult to agitate and was so viscous that it failed to flow on entering the kiln, regardless of its water content. Building up in the feed end of the kiln was common, and to such an extent that it was necessary to stop the kiln frequently to remove the accumulated mud rings.

Effect of Disc Installation

The disc filter removed more than one-half of the water further permitted continuous kiln operation and resulted in the slurry and produced a cake which proved an ideal feed for the kiln, eliminating the mud rings entirely. It in greatly increased clinker production at a much lower coal consumption. Prior to the filtration of the slurry, 107 to 112 lbs. of coal per barrel of clinker burned was the average fuel consumption. Attention is again called to the use of slag in place of clay or shale; probably 45 per cent lime in the form of oxide (CaO) is present in the slag, thereby requiring less limestone ($CaCO_3$) in the raw mix and consequently less coal to burn.

With the filters operating continuously, the clinker output increased, while less than 75 lbs. of the same coal were required per barrel burned, or approximately 32 per cent saving in fuel.

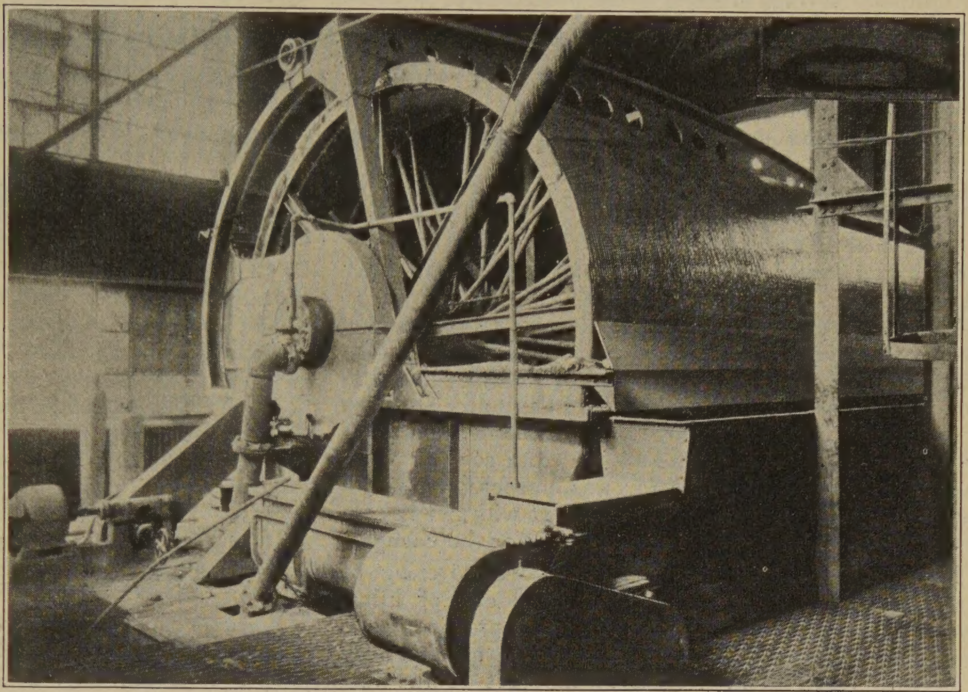
The kilns in question measure 10 by 150 ft. and operate in connection with waste heat boilers.

There are now two other slag-limestone plants using the disc filters with excellent economies.

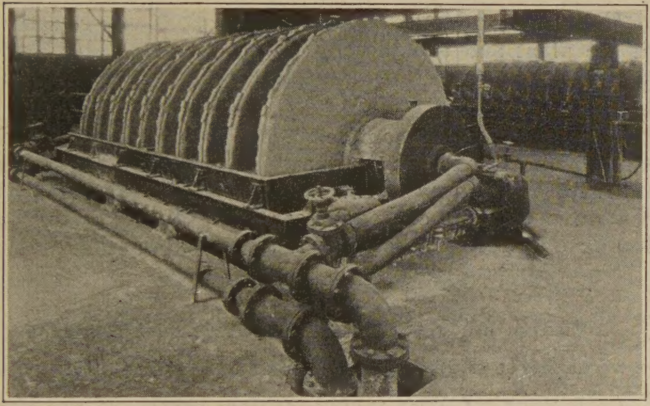
The disc type filters are operating in six limestone-clay plants with fifteen kilns ranging in length from 150 to 240 ft. with slurry moistures from 33 to 38 per cent, some with and some without waste heat boilers. The filters reduce this moisture to 18 to 20 per cent with coal savings ranging from 23 lbs. per bbl. to 30 lbs. per bbl., depend-

Some Cement Slurry

Plant No.	1	2	3A	3B	4	5	6	7
Kilns	2	2	6	6	1	3	3	2
Kiln Size	10′x150′	10′x175′	8′x100′	8′x100′	10′x11′x175′		10′x165′	10′x240′
Slurry Moisture	33-34%	Never Oper.	33-34%	42-48%	36-38%		34%	33%
Production on Slurry	1100	Never Oper.	600	400	Never Oper.		1250	1500
Coal Rate on Slurry	112	Never Oper.	140	225	Never Oper.		165	120
Filter Cake Moisture	16-18%	21-22%	18.6%	23%	18-21%		18.6%	19.0%
Production on Filter Cake	1500-1700	1600-1800	840	600	1700-1800	No information can be given on this plant	1500-1700	2000
Coal Rate on Filter Cake	72-75	100	105	150	95-100		115	95
Max. Production on Filter Cake	1700	2000	840	600	1890		1700	2100
Filter Area per Kiln	1000	1000	1200	1200	3200		1220	1400
Square Feet per Barrel	1.7	2.0	0.7	0.5	0.56		1.39	1.5
Raw Material	Limestone Slag	Limestone Slag	Limestone Clay	Marl Clay	Limestone Clay Shale		Limestone Clay	Limestone Clay
Filter Cost per Kiln	$11,000	$11,000	$15,000	$15,000	$36,000		$18,000	$17,000
Complete Cost	$20,000	$25,000	$30,000	$30,000	$50,000		$32,000	$30,000
Production for Cost Figure	1600	1800	800	600	1800		1600	1800
Cost/Bbl. Daily Capacity	$12.50	$13.90	$37.50	$50.00	$27.50		$20.00	$16.70
Cost/Bbl. of Yearly Capacity (360 day year)	$0.0347	$0.0386	$0.104	$0.139	$0.0772		$0.0556	$0.0464



A typical drum type filter installation for limestone-clay slurry



Disc type of filter installation for slag slurry

ing on the amount of water removed and the length of the kilns. The coal rates after installation of the filters range from 90 to 105 lbs. per bbl. and the kiln capacities have been increased when desired from 20 to 30 per cent, this also being in direct proportion to water removed.

Two marl-limestone-clay plants with 8 kilns are equipped with disc filters which reduce kiln feed moistures from 42 to 55 per cent and 23 to 28 per cent. The removal of this enormous quantity of water gives coal savings as high as 75 lbs. per bbl.

The advantages afforded by the filters in the above installations briefly listed are as follows:

1. Reduction in coal rate—always.
2. Increase in kiln capacity—wherever desired.
3. Elimination of mud rings—wherever experienced with slurry feed.
4. Smaller and more uniform clinker, giving more uniform burning.
5. Increased steam to waste heat boilers, wherever boilers are used.
6. Suitable means of using dust from kiln housings, boilers or precipitators.
7. Increased slurry moisture to give better grinding conditions without added cost for burning.

A fair cost of operation on the disc filter installations is about 1½ cents a barrel, this cost including the cloth,

Filter Installations

Plant No.	8	9	10	11	12	13	14	15
Kilns	4	2	3	1	4	2	3	2
Kiln Size	10′x150′	11′x175′	10′x8′x235′	10′x11′x175′	10′x175′	11′x200′	11′x175′	10′x175′
Slurry Moisture	33-34%	45-50%	33-34%	35-36%	———	34-35%	36%	40%
Production on Slurry	1100	———	1450	1250	———	1500	1500	———
Coal Rate on Slurry	129	———	125	130	———	135	130	———
Filter Cake Moisture	18.5%	23-28%	18.5%	19.0%	———	19%	19% (Estimated)	22%
Production on Filter Cake	1300-1400	1400-1500	1700-1800	1600-1650	———	2000	2000	1800
Coal Rate on Filter Cake	100	———	93	100	———	105	———	———
Max. Production on Filter Cake	1500	1500	1800	1650	———	2000	2000	1800
Filter Area per Kiln	2000	3400	2000	1800	1125	1200	2400	1000
Square Feet per Barrel	0.75	0.44	0.90	0.9	———	1.666	0.835	1.8
Raw Material	Limestone Shale	Marl Stone Clay	Limestone Shale	Limestone Shale	Limestone Shale	Cement Rock	Cement Rock	Slag Limestone
Filter Cost per Kiln	$24,000	$39,000	$24,000	———	———	$15,000	$30,000	$13,000
Complete Cost	$40,000	$65,000	$38,000	———	———	$25,000	$45,000	$24,000
Production for Cost Figure	1400	1500	1700	———	———	2000	2000	1700
Cost/Bbl. Daily Capacity	$28.60	$43.50	$22.30	———	———	$12.50	$22.50	$14.20
Cost/Bbl. of Yearly Capacity (360 day year)	$0.0794	$0.12	$0.0622	———	———	$0.0347	$0.0625	$0.0392

labor, power and maintenance. The exact amount, of course, depends on local conditions.

Other Savings Credited to Filters

Additional savings credited to the installation of filters in this particular plant are as follows:

Fifty per cent reduction of power required for draft fans.

Reduction of wear on fan blades.

Ten man hours per day less time required to clean boiler tubes.

Less dust in boilers.

Elimination of mud rings.

Fewer coal or fire rings.

Stack and boiler dust introduced into kiln with filter cake.

Attention was called in an earlier paragraph to the gross savings and deductions which must be made in arriving at the net amount saved through a filter installation. Under cost of operation, we find the power required to operate the suction pump, used to draw a portion of the water from the slurry through the cloth covered filter. The fine cotton fabric used for this purpose sometimes breaks or tears, necessitating replacement with newly covered sectors, which are kept in readiness for the change.

This operation, together with the actual covering of sectors, requires extra labor at the feed end of kilns, though it should be stated that this item is practically the same with a three- or four-kiln installation as it is with a one-kiln installation. Added to the cost of the fine grade of cotton cloth used, and combined with the fixed charges, we have a considerable sum to offset the above noted savings.

Drum Type

The drum type of continuous filter has also demonstated that fuel economy can be attained by its use. In a well-known plant in the middle west where limestone and clay slurry average 35 to 36 per cent moisture, a filter drum covered with fine cotton cloth rotates partially submerged in the trough of slurry.

The filter cloth is connected to the hub of the drum by a series of pipes through which water is drawn to the suction pump. A series of strings revolves with the filter drum and removes the thin layer of dewatered slurry from the cloth. About one-half of the original percentage of water remains in the flaked slurry as fed to the kiln. Coal consumption at this plant has been reduced from more than 120 to 96 lbs. per barrel of clinker burned, with a substantial increase in clinker output.

Cost Comparisons Necessary

Manufacturers who employ the wet process in building a new plant should consider the comparative costs of a plant of given capacity with medium length kilns, filters and waste heat boilers, against one of the same capacity with long kilns, without filters and waste heat boilers. Another alternative is the installation of long kilns with filters, but without waste heat boilers. Along with the capital investment involved, and probably the governing factor in making a decision when several sets of plans are submitted, is the manufacturing cost per barrel of cement produced. Naturally the scheme which insures the lowest manufacturing cost should be adopted, even though the capital investment may be increased by this procedure. In some sections of the country power can be purchased at a very low figure—5 to 6 mills per kwh. Where this obtains, cement companies have not been favorable to the necessarily large expenditure for waste heat boilers, turbo-generators and auxiliary equipment for complete power generation. Interest, depreciation and maintenance costs reach a total figure that has made waste heat boilers unattractive to those plants which are able to purchase their power requirements for less than 7 mills per kwh.

Possibilities in Long Kilns Without Filters

In such cases, long kilns with filters should be carefully considered and the net savings, if any, determined over operating the same long kilns without filters, bearing in mind the point brought out earlier in this article, that some long kilns are burning less than 100 lbs. of coal per barrel of clinker without filters, and the capital and operating charges of a filter installation partly offset increased kiln production of filter cake over slurry.

Sixteen American cement plants are now operating filters; one other plant is at present installing this equipment. The fact that 17 operators have adopted this method of dewatering slurry indicates marked economy in its use. Experimental tests will determine the probable savings which the remaining wet process manufacturers may expect through the installation of filters.

Columbia Cement Starts Work on Quarry; Mill Plans Ready

Work is under way on the quarry for the $3,000,000 cement plant to be erected by the Columbia Cement Company at National City, Calif. The quarry is situated four miles from the Imperial Valley-San Diego highway, at the base of Coyote mountain.

The company has completed plans for the construction of the plant and actual building is awaiting materialization of plans by the government and harbor department for the development of the inner harbor.

When the plant is completed, the firm expects to construct a spur track from the quarries to the main line of the railroad. The supply of raw material to be used is said to contain a calcium carbonate of lime 97 per cent pure. Kaolin clay for white cement is also available.

Texas Production Increases More Than 1,000,000 Barrels in Year

An increase of more than 1,000,000 barrels in the production of cement in Texas took place last year, according to "The Wall Street Journal." The industry in the state has more than doubled in the past eight years. During December, Texas cement manufacturing plants turned out 593,000 barrels, a decline of 9 per cent from November, which is about in line with seasonal influences. This compares with an output of 472,000 barrels in December, 1928. One more plant was in operation in December, 1929, than in December, 1928. A total of 7,369,000 barrels was produced in 1929, compared to 6,345,000 barrels in 1928, or a gain of 6.1 per cent. This is by far the highest output on record for Texas.

Great Lakes to Grind Clinker at Cleveland

The Great Lakes Portland Cement Corporation, Buffalo, N. Y., has contracted for the enlargement of its plant at Cleveland, Ohio, to include a grinding mill with a capacity of 1000 barrels a day. The plant has heretofore been devoted to handling and sacking only. The new unit is expected to be in operation by April.

Effect of Grading Cement

Relation Between Grading and Strength Demonstrated by Tests—Agrees with Conclusions of Dr. Kuhl—Most Important with High Water-Cement Ratio

By PROF. OTTO GRAF

IN *Zement*, 1929, p. 1322, Kühl demonstrated by means of interesting tests that the grading of cements has apparently a considerable effect on the strength properties of cements.* This effect was observed by the author at an earlier occasion in connection with another determination. In platting the relation of the weight per unit volume of standard test cubes to their compressive strength, as shown in Fig. 1, one observes that the weight per unit volume of the mortar increases in a general way with higher strength values.[1] The study of this relation was continued at a later date. Further observations are partly reproduced in Fig. 2. Here also is observed a generally higher weight per unit volume for cements of higher test strengths. This determination shows that the grading of cement is of considerable influence and warrants a detailed study.

Standard Tests Not Sufficient

The effect of grading is even more apparent when, instead of the standard sand, we begin to deal with a graded sand. The author has repeatedly emphasized that the present method of judging a cement by means of the standard testing procedure is not sufficient, when cements are to be used in concrete with low cement content and high quantity of mixing water.[2]

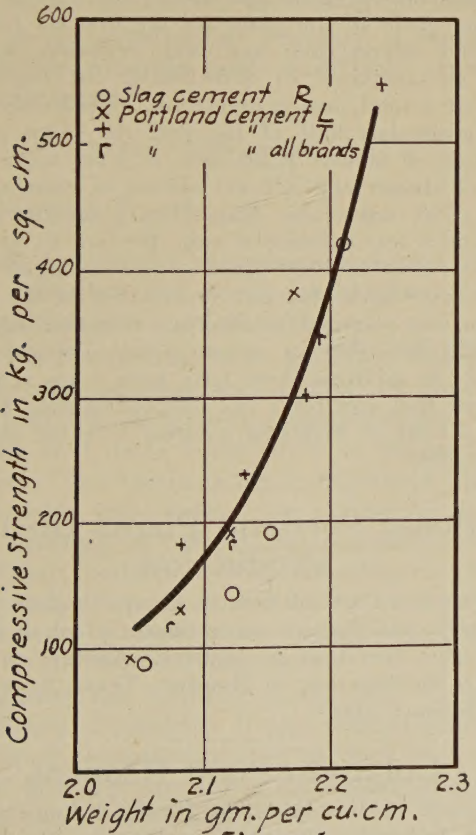


Figure 1.

Table 1 shows examples of the divergence of strength values between mortars of "soft" consistency and graded sand and those of the standard "moist" (erdfeucht) consistency. The ratios are:

For standard test strengths:
671 : 369 : 342 = 1 : 0.55 : 0.51
For mortars of graded sand and "soft" consistency:
1 : 2 666 : 202 : 172 = 1 : 0.30 : 0.26
1 : 4 294 : 58 : 49 = 1 : 0.20 : 0.17

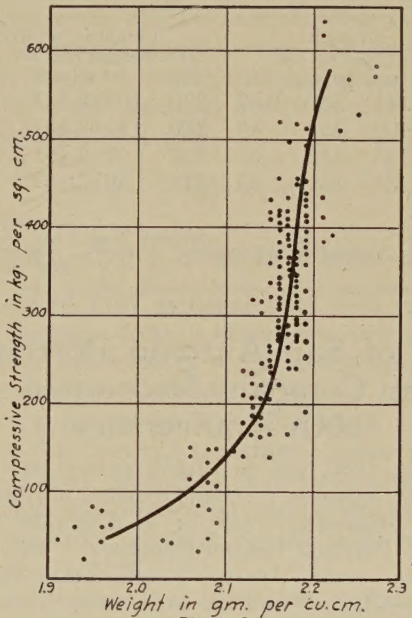


Figure 2.

The difference becomes greater with increasing quantities of mixing water. This result gives reason for keeping in mind when dealing with chuted concrete or any concrete mixed with a great deal of water, that there are cements which under such conditions will not yield the strength expected on the basis of standard tests. Further examples are contained in Table 2. A particularly convincing case was encountered by the author in the course of the past year. The following data are quoted from tests made in connection with it, which helped to solve the difficulties:

	Cement *a*	Cement *l*	Cement *g*
Standard strength K_n	570	546	546 kg. per sq.cm.
Mortars of wet consistency 1:4, $w = 0.88$, K_{28}	186	154	46 kg. per sq. cm.
$K_n : K_{28}$	1:0.32	1:0.28	1:0.08

---

*Translated from *Zement*. See translation in Mill Section of CONCRETE, Feb., 1930, pp. 111-116.

[1] Compare Graf, "Der Aufbau des Mortels und des Betons," 1st edition 1923, 2nd edition 1927, 3rd edition 1930 (on the press), Publ. Julius Springer, Berlin.

[2] *Tonindustrie-Zeitung*, 1927, p. 1564; *Zeitschrift des Vereines Duetscher Ing.* 1929, p. 1401.

Supplementary Tests Needed

The tests demonstrate convincingly that in certain cases the standard tests now used, based on mortars of standard "moist" consistency, seldom encountered in the field, should be supplemented by tests of mortars of wet or sloppy consistency mixed with graded sands, such as are more nearly true to actual conditions.

Here also the effect of the grading of cement should become apparent.

TABLE 1

Strengths of Mortars of Varying Consistency

1	2	3	4	5	6	7	8
		Cubes of graded sand					
	Standard Compressive Strength	Water-cement ratio *w*			Compressive strength—kg. per sq. cm.		
Cement	K_{n28}	1:4 moist	1:2 soft	1:4 soft	1:4* moist	1:2† soft	1:2† soft
D	671	0.39	0.41	0.66	581	666	294
B	369	.37	.47	.75	311	202	58
R	342	.37	.47	.75	256	172	49

---

*1 day in moist air, 27 days in water of 15 to 20 deg. C.

†1 day under moist cloths, 6 days in water of 15 to 20 deg. C., 21 days dry in a room with 15 to 20 deg. C. temperature of the air.

TABLE 2

Strengths of Mortars of Different Cements

1	2	3	4	5	6	7	8
	Standard Cement tests			Mortar of 1 part by weight cement and 3 parts by weight Rhine sand*			
	Water-cement ratio	Compressive Strength kg. per sq. cm.				Compressive Str.-kg/sq.cm. (Weight/unit vol. gm/cu.cm.)	
Cement	*w*	7 days	28 days	*w*	g† *mm*	7 days	28 days
S	0.33	341	549	0.63	230	102(2.14)	223(2.04)
N	.33	309	451	.65	230	111(2.15)	224(2.03)
H	.31	233	432	.61	232	62(2.16)	159(2.04)
P	.35	221	405	.65	228	59(2.16)	136(2.02)

---

*Rhine sand with amount passing sieve

	Diameter of opening			
	900 mesh/sq.cm.	1 mm.	3 mm.	7 mm.
*Rhine sand with amount passing sieve	7.3%	72.9%	84.3%	100%

†Measure of consistency, see *Tonindustrie-Zeitung*, 1927, p. 1564.

History of San Antonio Portland Cement Company Recounted on 50th Anniversary

January 16, 1930, was the fiftieth anniversary of the beginning of the business of manufacturing portland cement west of the Mississippi river by what is now called the San Antonio Portland Cement Company. "This long record has been made," states "Southwestern Resources," "with practically one and the same man at the head of affairs during all these years—Charles Baumberger, Sr., the president."

"A Romance in Business" is the title of a chapter on "the small beginning of a great San Antonio industry fifty years ago" contained in this monthly publication devoted to the Southwest and its resources.

The story tells of the finding of cement making materials in that year, and how four local men interested themselves in the project, obtaining a lease from the city for the use of the stratum of clay under the limestone in the San Antonio rock quarry. A small plant was erected and in the latter part of 1879 began work in a small way.

"Papers to incorporate the Alamo Portland and Roman Cement Company, with a capital of $3,150, were drawn and filed on January 16, 1880," the story continues. "Financial difficulties soon began, however, and in the summer of 1880 preparations were made for a new start for the firm, a reorganization being effected. At this point Charles Baumberger entered the picture, as manager. The plant at this time produced 10 barrels of cement a day.

"On September 20, 1881, the charter was amended changing the name to Alamo Cement Company, with the capital increased to $10,000. For the first four years of its life the 'first portland cement plant west of the Mississippi river,' had its office in a drugstore. But the increased capital put into the business in 1881 caused more prosperity, and in 1884 the company built an office and warehouse.

"Opportunities for the sale of cement were not many, lime and sand made the mortar of the early construction, and for another twenty years, the business, while making a small profit, was not setting the woods on fire in that direction.

"Dr. Kalteyer (one of the founders) died in 1897 and Charles Baumberger became president, since Dr. Kalteyer's heirs, with the exception of Fred Cook, his son-in-law, were not keen on investments in the cement business. But Baumberger and Mr. Cook were and they 'stuck' while the others sold their interests.

"In 1907, Baumberger, Cook and Albert Kronkosky bought a considerable tract of land containing large deposits of ideal cement material, where the plant is now located. Following the purchase of the land Baumberger, Cook and Kronkosky bought out the other old owners and in that year organized the San Antonio Portland Cement Company with a capital of $200,000. This was later increased to $250,000 and again to the present capitalization of $300,000.

South Dakota State Plant More Than Doubles Profit in 1929

A net profit of $84,247.60 after depreciation and interest had been deducted, was made by the South Dakota cement plant at Rapid City during 1929, according to a state auditor. This is an increase of $44,969.95 over 1928, when the net profit was $39,377.65.

The net profit of the plant for the first six months of 1929, after depreciation had been deducted, was $83,058.65, as compared to $103,888.95 for the last six months, or a total, less depreciation, of $186,947.60.

During the last half of the year the plant produced 23,626 tons of shale, 76,306 tons of lime rock, 324,495 barrels of clinker and 322,363 barrels of cement.

The report states also that, "The plant for the year 1929 made a very substantial gain, the best in its history. Indications are that 1930 business will be larger than for the year just closed, and test the capacity of the plant.

"There was returned to the state treasurer since June 30th, 1929, $150,000 for cement plant interest and sinking fund. In addition there have been prior remittances to the state treasurer for a like purpose totaling $450,000, making a total of $600,000 remitted with the closing of the year 1929."

National Portland Plants Go Into Production

The National Portland Cement Company plant at Chubbuck, Calif., and the first white cement plant on the West coast, began operation in January. Another new plant owned by the company at Houston, Texas, began operation in January also.

Colorado Plant Reopens

The plant of the Colorado Portland Cement Co. at Portland, Colorado, reopened on January 31st after the usual seasonal shutdown.

~ EDITORIAL ~

Keeping the Conference Promises

THE entire business and industrial world is familiar with the steadying effect of the business conferences called by President Hoover following the stock market collapse of October and November.

Fortunately the man at the head of the government knows something about business psychology. Knowing that similar debacles in times past have first created fear, then panic, the President forestalled them both by getting the leaders of finance, industry and labor together to talk things over.

One of the most far-reaching results of the conferences was the promise of large construction programs for 1930, obtained from officials of public utilities and the construction departments of states and cities.

We know now that those promises are being kept, for the January construction reports issued by the F. W. Dodge Corporation tell the story. Actual contracts awarded exceeded those in December by about seven million dollars; but the real story appears in the tabulation of contemplated construction, which in January exceeded all previous records. The total stands at $1,455,349,600, compared with $864,230,600 in December and $818,284,000 in January, 1929. These contemplated projects will pass on to the status of actual contracts in increasing numbers.

So far as the construction industry is concerned, the November promises and predictions were not empty declarations.

◆

The Cement Institute

A NEWS item in the construction section of this issue describes the work undertaken by the newly organized Cement Institute.

During the few months of its existence this organization has adopted rules and regulations governing fair trade practice, set forth in a code of ethics. Division offices have been established in Chicago and Kansas City. The Institute has inaugurated the collection of credit information, the tabulation of contracts for delivery of cement and commitments for future delivery, collection of information on clinker stocks and cement stocks on hand, data on cloth sack returns, and the dissemination of this classified information to its member companies.

The Institute has nothing to do with the price, sale or delivery of cement. It was formed primarily as a statistical organization, and as such it is functioning. It is not in any sense duplicating the work of the Portland Cement Association.

The work undertaken by the Institute should have a stabilizing effect, because of the reliable data supplied to the men at the helm of the industry.

◆

Getting Ready for Two Kinds of Cement

THE American Society for Testing Materials is adopting a tentative standard specification for high early strength portland cement.

It may be accepted as a foregone conclusion that architects and engineers will specify high early strength cement to an extent much greater than at present, as soon as this proposed tentative standard becomes available and is given general distribution.

In plants that are not already producing high early strength cement, some alterations and new installations of equipment will be needed. No time should be lost in making a plant survey and coming to a decision on the new installations required. In this way the expected demand for this new kind of cement may be anticipated.

◆

Revamping the Cement Plant Now

SOME cement mill managements took advantage of the January drop in shipments to close down for a complete overhauling of old equipment and the installation of new equipment. Others are making alterations and repairs on a smaller scale.

The plant that has not undergone some overhauling is likely to be operating at a disadvantage later this year, when the present enormous volume of contemplated construction work begins to be translated into orders for cement.

Changes and repairs in plant and equipment can be made now without serious interference with production. Changes deferred to the high production season will be made under a handicap and will be far more costly than at present.

◆

The Trend Is Upward

THE construction trend is definitely upward. The January construction reports published in the construction section, when considered collectively, are encouraging in this respect; but various reports received since January show definite improvement.

The upward slope is not steep, but it is the right kind of a slope. It indicates gradual and steady increase in activity rather than a temporary spurt. For this very reason the improvement promises to be maintained.

Four Firms Contract to Furnish Oklahoma Cement; Commissioner Suggests State Plant

The regular market price less 10 cents a barrel, the usual commission allowed dealers in territory where cement is sold, will be paid by the state of Oklahoma for the 1930 supply of cement to be used in road building, it was decided January 28th, when contracts for cement were made with four companies.

Four companies—Dewey Portland, Oklahoma, Monarch and the Universal Atlas Cement Companies—will furnish 200,000 barrels each.

The Highway Commission reserves the right to increase or reduce the amount used 25 per cent.

Immediately following the awarding of the contracts, the chairman of the state highway commission began the advocation of a survey for the building of a state-owned cement plant.

Ten companies bid on the cement and all three members of the commission awarded contracts to the four companies, two of them operating in Oklahoma. The commission chairman declared the two Oklahoma companies took advantage of the state statutes which provide for giving preference to home industries.

Some Details of a New G. & T. Earle Plant

The new cement plant of G. & T. Earle, Ltd., at Hope, Derbyshire, England, was opened recently.

Two considerations influenced the Associated Portland Cement Manufacturers, Ltd., in the choice of Hope Valley as a site for the new works. On the raw material side there is a depth of about 2,500 vertical feet of limestone for quarrying in the hills flanking the valley, while in the valley itself decomposed shale and alluvial deposits which have worked down from the higher ground have formed a clay of a silica ratio which makes it an excellent material for cement in general, and particularly for rapid-hardening portland cement. On the distribution side, the site of the plant may be described in relation to the cement-using areas of the United Kingdom as possessing an "eligible central location." Industrial Lancashire and Yorkshire counties in the north in a big half-circle link up with another half-circle of the industrial Midlands from Crewe to Nottingham in the south. It was necessary to link up the plant site with civilization by some pioneer road and railroad construction.

The works are located nearly a mile from the village of Hope, and a concrete road 18 feet wide has been made between the two places. A branch railroad, nearly two miles long, has been constructed between the site and the London, Midland & Scottish main line, and a total length of 7,000 yards of railroad sidings has been made. The scheme involved the construction of a viaduct over the main highway from Sheffield to Manchester via Chapel-en-le-Frith, and also two smaller bridges. These structures are all of reinforced concrete, local limestone being used as aggregate. The electricity required for the works is supplied by the Yorkshire Electric Power Co. by two overhead power lines from Barugh and Ferrybridge.

The sequence of manufacturing operations at Hope is very simple. Limestone is quarried horizontally from a hill 500 feet above the level of the works and immediately behind the kilns. The stone is taken from the summit in horizontal slices about 60 feet deep, and in this way the hill will be gradually lowered. Explosives are inserted in deep borings and electrically fired. It is possible to blast over 280,000 tons of stone in one operation, and all the loosened stone is less than 4 cu. ft.

On the quarry floor level the main crusher brings the stone down to 6 in. cubes. From this belt conveyors carry the stone through a cone crusher, which reduces it to ½-inch cube, to storage bins at the grinding mills. The clay, after excavation on the opposite side of the works, is tipped direct from the scraper into wash mills, liquefied, and pumped to storage tanks also at the grinding mills.

From the limestone storage bins and the clay slip tanks proportioned quantities of both materials are brought together in the wet grinding mills, which convert the mixture into slurry. The slurry is fed from storage tanks into the rotary kilns, of which there are two at Hope, each 289 feet in length by 10 feet in diameter. In these the water present in the slurry is evaporated and the solid residue then heated at 2,800 degrees F. The slurry is fed continuously into the kiln and moves by gravitation from one end to the other.

Each of the kilns embodies a cooling system. This consists of a set of 12 cylinders, each 4 ft. in diameter and 20 ft. long placed around the discharge end of the kiln, the center line of the cylinders being parallel to the center line of the kiln. The hot clinker leaves the kiln shell at its extreme end and is discharged through 12 holes on its periphery into each of the 12 cooler cylinders. In each of these the clinker is slowly transferred to the discharging end, where it falls on to a belt conveyor and is carried to one of the hoppers on the kiln side of the clinker store.

Wolverine Cement Earnings Increased

Net income of the Wolverine Portland Cement Company for the year ended December 31, 1929, amounted to $81,809 after all charges including federal taxes. This is equal to 81 cents a share on the outstanding stock and compares with $51,031, or 51 cents a share in the preceding year. Net sales for 1929 were $841,781 as against $881,446 in 1928.

The balance sheet as of December 31, last, showed current assets of $658,229 and current liabilities of $35,157 as compared with $690,495 and $33,966 respectively at the end of 1928. Surplus last December 31, totaled $198,115 in comparison with $174,832 a year earlier.

Plants with Perfect Safety Records Increase in 1929

Although final figures will not be ready for some time, tentative tabulations made by the Portland Cement Association show that 27 plants operated throughout 1929 without lost-time accident. There were, however, 836 accidents, including 39 fatalities and 1 total disability.

These figures compare favorably with those for 1928, when there were but 20 perfect records and more than 950 lost-time accidents.

Of the 27 plants winning the association trophy for their 1929 records, 3 have had perfect records for three years and 5 for two years.

Giant Earnings Higher for Past Year

The Giant Portland Cement Co. reports for the year ended December 31, 1929, a net income of $84,261, after depreciation, interest, federal taxes, loss on dismantled machinery, etc., equivalent to $2.26 a share (par $50) on 37,233 shares of 7 per cent preferred stock.

The net income in 1928 was $174,870, equal, after 7 per cent preferred dividend requirements, to $1.98 a share (par $50) on 22,085 shares of common stock.

Estimating
Calcium and Magnesium Carbonate in Raw Mixtures or Limestone

More Rigid Chemical Control Necessary to Maintain Uniformity — Acid and Alkali Titration — Method of Single Titration—Equipment Required—Procedure Described in Detail

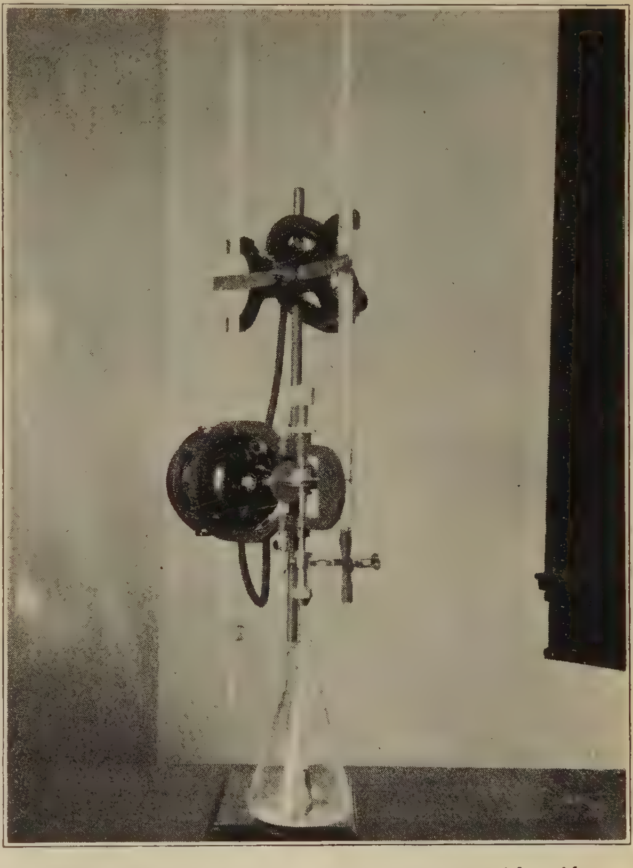
By RAPIER R. COGHLAN

THE growing tendency of engineers to demand higher test strength values for portland cement is forcing a more rigid chemical control in the manufacture of the product. As our knowledge of the constitution of portland cement clinker broadens the relation of constitution to physical properties becomes more apparent and the producer knows with some degree of sureness what alteration of composition or mechanical procedure must be made with a particular set of raw materials in order to meet proposed changes.

It may be said, using a much hackneyed phrase, that the industry is more "composition conscious" than it was ten or fifteen years ago. Never was the other fellow's product or process under more surveillance than today. Any material that reaches the market showing a variation from the established record of the producer under question finds itself under examination in all of its competitors' laboratories within a short time after its appearance. Claims of high early strength as indicated by the standard tensile test for portland cement are of little value unless fortified by similar behavior in concrete of ordinary composition and workable consistency. Nearly all producers today have research laboratories of varying degrees of latitude for research of their own and their competitors' products.

Uniformity of Chemical and Physical Properties Necessary

The demand for higher strength values carries with it the necessity for increased uniformity of physical and chemical properties. No matter what theories may be held regarding the mineral constituents of clinker at equilibrium, the manufacturer knows that certain ratios between the various oxides as determined by chemical analysis give certain definite physical results. Thaddeus H. Merriman indicated this in his article on the "Lime-Silica Index," published in Engineering News-Record, April, 1926. Each chemist has his working hypothesis for the particular set of raw materials with which he has to deal. No one knows better than he the necessity for a uniform chemical composition of the raw kiln feed, uniform mechanical preparation and clinkering and uniform final preparation into cement. Much is said about burning the clinker to equilibrium. Dr. Bogue has developed a method for determining the uncombined lime in portland cement clinker. Unfortunately the method is tedious and not well adapted to routine work. S. L. Meyer has improved the method and shortened the time until there is little excuse for not making it a part of the daily laboratory routine. The soundness test merely indicates that the uncombined lime is not present in dangerous amounts but fails to tell, when coupled with the chemical analysis, what the manner of combination of the various components may be. A study of Mr. Meyer's article, "Free Lime in Portland Cement," in "Rock Products," Nov. 23, 1929, is well worth while.


Motor stirrer in position for back titration with acid

Acid and Alkali Titration

The time-honored method for compounding cement raw mixtures is to mix argillaceous and calcareous materials in such proportions that when calcined and clinkered the lime in the resultant clinker is that necessary to give a perfect combination as indicated by the soundness test. This percentage is determined at the outside by titrating a sample of the compounded mix with standardized acid and alkali. The other oxides—silica, alumina and ferric oxide—determine how much lime can be carried and give a perfect boil. At times magnesia is one of the principal determining factors. The details of the acid and alkali titration are familiar to all chemists. The hydrochloric or nitric acid is made up to 0.4 molal, 0.5 molal, or 1.0 molal strength. The sodium hydroxide is made up to similar strengths. Naturally the more dilute solutions give greater accuracy to the determination. The accuracy of the various strengths is as follows:

Molal Strength	Value of 1 ml. in grams $CaCO_3$	Value of 1 ml. in grams $MgCO_3$
0.4	0.0200	0.01680
0.5	.0250	.02100
1.0	.0500	.04200

Some chemists prefer to have the acid twice the strength of the alkali, as it facilitates solution of the carbonates. Others prefer acid and alkali of the same strengths. For the determination of magnesium carbonate as well as calcium carbonate this is essential if the greatest accuracy is desired.

Method of Single Titration

The method of single titration of raw mix gives all carbonates present in the sample as equivalent calcium carbonate. The acid and alkali are standardized against pure calcite and the values stated in terms of calcium carbonate. The presence of magnesium carbonate is known but is taken into account only by raising the value of the titration. This proves satisfactory for plants which have to deal only with small quantities of magnesia, but is increasingly misleading as the amount of magnesia increases. As an example of the effect of varying magnesium carbonate, the table will show the importance of determining both calcium and magnesium carbonate. In every case the equivalent calcium carbonate by single titration was 76.50 per cent. Average ignition loss was 36 per cent.

$CaCO_3$	$MgCO_3$	$CaCO_3$ Equiv. to $MgCO_3$	CaO in mix	CaO in clinker
76.50	0.00	0.00	42.84	66.94
76.00	.42	.50	42.56	66.50
75.50	.84	1.00	42.28	66.06
75.00	1.26	1.50	42.00	65.62
74.50	1.68	2.00	41.72	65.18

With the argillaceous material remaining constant, it is apparent that conditions such as the above would result in marked differences in the degree of clinkerability and the quantity and quality of the cement resulting therefrom. A single titration of 76.50 equivalent calcium carbonate may indicate 66.94 per cent lime in the clinker or it may mean 65.18 per cent, a variation of 1.76 per cent. This is too important to neglect if one has in mind a fixed composition in the clinker. Generally the argillaceous materials are uniform in composition and such variations as do occur are minimized by the smaller amount of argillaceous material in the mix. It is generally sufficient to maintain a constant lime content. In wet process plants of sufficient slurry storage capacity it is a simple matter to maintain the lime going to the kilns wherever desired. In dry process plants this is more difficult and therefore requires a closer knowledge of the values of a titration.

Equipment Required

Newberry's method for the estimation of calcium and magnesium carbonates in limestones and raw mixtures is in use in a number of laboratories confronted with the magnesia problem. It is accurate in the hands of a skillful operator, but too tedious for a routine method. Hildebrand's electrometric method is accurate but unsuited to routine work because of the time required to bring the solution to equilibrium. The method is based on the fact that magnesium hydroxide is precipitated from neutral solution by means of alkali hydroxides. The precipitation commences after the pH concentration exceeds —7 and the pH curve remains horizontal until all the magnesium has been precipitated, when it takes a sharp upward trend. It was through study of this method that the present method was evolved. It may be designated as a modified electrometric, although all that remains of the apparatus is the motor stirrer. The hydrogen and calomel electrodes and other electrical equipment have been dispensed with.

THE METHOD

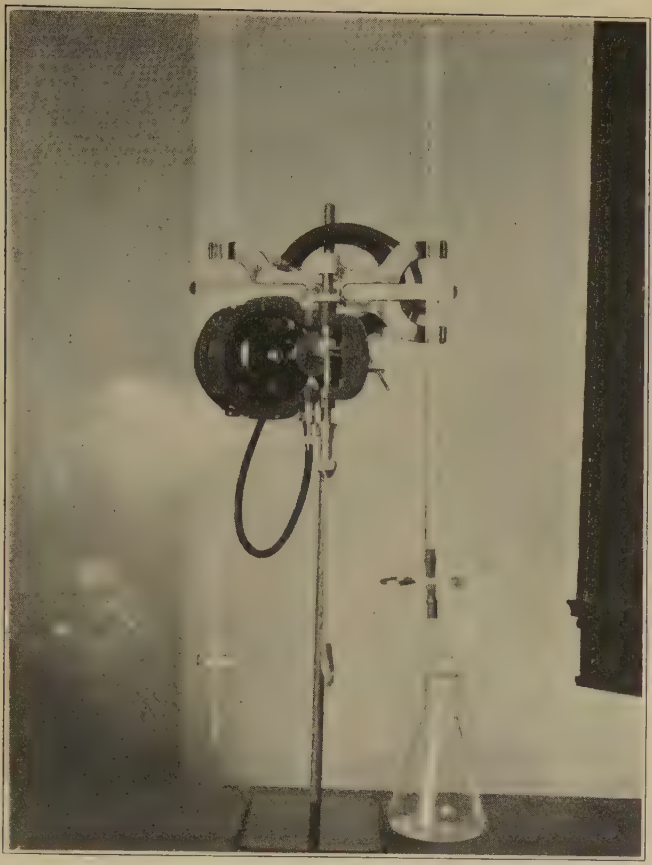
Equipment required:
- Solutions—
  - 0.4 molal hydrochloric or nitric acid.
  - 0.4 molal sodium hydroxide.
  - Phenol-phthalein indicator.
  - Distilled water.
  - Running tap water 70 deg. F., or cooler.
- Apparatus—
  - 1—50 ml. quick filling accurately calibrated burette for 0.4 molal acid used to dissolve sample.
  - 1—25 ml. burette for second titration with acid.
  - 1—25 ml. burette for alkali titration.
  - 250 ml. Erlenmeyer flasks for solution of sample and subsequent titration.
  - Electric stirring motor and glass rod suitably bent at end for stirring.
  - One or more electric hot plates or flask heaters.
  - One or more rubber stoppers to fit Erlenmeyer flasks with 30 by ¼ inch inside diameter glass air condenser fitted to same.
  - Equipment for suction filtration if sample is such that removal of argillaceous material before titration seems desirable.

The manner of assembling the equipment for operation is of course dependent upon the laboratory and the personal wishes of the man in charge. The author has found the glass used for microscopic illumination a great aid in making titrations as it gives ideal daylight conditions at all times. A sheet of this glass is inserted in the top of the table with a lamp beneath and makes the detection of the end point independent of the degree of light in the room.

Procedure in Detail

A 1-gram sample of the limestone is weighed into a 250 ml. Erlenmeyer flask and covered with 50 ml. 0.4 molal hydrochloric acid. The flask is stoppered with the stopper and air condenser and placed in the heater until solution of the carbonates is complete. The flask is then removed from the heater and cooled in running tap water. The tube is rinsed with distilled water and the stopper removed. After washing down the neck of the flask, a few drops of phenol-phthalein indicator are added and the excess acid is titrated with 0.4 molal alkali until the first faint pink coloration appears and remains for at least ¼ minute. The reading of the alkali burette is noted as "first alkali." Then 5 ml. excess alkali are run in and the stopper replaced in the flask and the contents heated to boiling. The flask and contents are again cooled under running water, and after removal of the stopper and tube, the glass stirrer is lowered into the flask and the motor is started. The contents of the flask are given a rapid whirling motion. Acid is admitted into the vortex of the whirl until the pink color disappears momentarily. The reading of the acid burette is then noted as "second acid." The pink color reappears on standing.

In the first titration with the alkali the solution has been brought to a neutral state. Excess alkali and boiling pre-



Set-up for first titration with alkali

cipitate $Mg(OH)_2$, which is only slightly soluble in cold water (.0009 parts in 100 parts of cold water). The second titration with acid again brings the solution to a neutral state for a moment. Almost immediately hydrolysis of the $Mg(OH)_2$ supplies —OH ions and the pink color returns.

Occasionally the end points are difficult to detect on account of the color of the insoluble residue and organic matter. In such cases the insoluble residue is easily filtered from the solution before titration with the alkali is started. The accuracy of the work is increased by filtration.

A specific example will best illustrate the application of this method and will give an idea of the accuracy to be expected from its use. A kiln feed analysis is given and the lime and magnesia have been calculated to carbonates and the value of the regular single titration method is indicated.

	Per Cent
Ignition loss	36.99
SiO_2	12.49
Al_2O_3	3.58
Fe_2O_3	1.51
CaO	42.30
MgO	2.63

	Per Cent
CaO calculated as $CaCO_3$	75.54
MgO calculated as $MgCO_3$	5.52
CaO and MgO calculated as $CaCO_3$	82.11

Duplicate samples of this kiln feed were handled by the double titration method.

	Ml.
First acid for solution	50.0
Second acid for excess alkali	2.4
Total acid	52.4
First alkali for neutral condition	9.8
Second alkali for precipitation	5.0
Total alkali	14.8

$(52.4 - 14.8) \times .0200 \times 100 = 75.20$ per cent $CaCO_3$.
$(5.0 - 2.4) \times .0168 \times 100 = 4.37$ per cent $MgCO_3$.
4.37 per cent $MgCO_3$ is equivalent to 5.20 per cent $CaCO_3$. Therefore by the single titration method the value of the sample would have been reported as $75.20 + 5.20 = 80.40$ per cent equivalent $CaCO_3$, or, as it would have been reported, $(50 - 9.8) \times .0200 \times 100 = 80.40$ per cent $CaCO_3$.

Duplicate samples of the same kiln feed were treated by filtration after solution.

	Ml.
First acid for solution	50.0
Second acid for excess alkali	2.3
Total acid	52.3
First alkali for neutral state	9.8
Second alkali for precipitation	5.0
Total alkali	14.8

$(52.3 - 14.8) \times .0200 \times 100 = 75.00$ per cent $CaCO_3$.
$(5.0 - 2.3) \times .0168 \times 100 = 4.54$ per cent $MgCO_3$.
Equivalent titration single method was $(50 - 9.8) \times .0200 \times 100 = 80.40$ per cent $CaCO_3$. Without filtration the titration with acid is a little difficult because of the pinkish color of some of the argillaceous material.

Since the clay contains lime and magnesia in combination with silica and alumina, this method does not determine them. They are generally quite constant in amount and do not affect the value of the titration for maintaining a constant lime content in the kiln feed.

This method is quickly grasped in the laboratory, and it makes great accuracy possible.

Riverside Profits and Assets Show Increases

Riverside Cement Co., successor to the Riverside Portland Cement Co., reports net profit of $1,013,084 for the year ended December 31, 1929.

The company was organized as a Delaware corporation in April, 1928, and net profit for the eight months ended December 31, 1928, was $934,787.

Total assets at the end of 1929 amounted to $12,645,097, an increase of $394,074 during the 12 months. Current assets totaled $3,520,285 on December 31, 1929, and current liabilities $455,141, a ratio of more than 7 to 1. Earned surplus to December 31, 1929, amounted to $212,584, bringing accumulated surplus to $2,184,860.

It was stated in a letter accompanying the company's report that "in spite of the reduction in business available to local cement companies through the importation of foreign cement in large quantities, the earnings of Riverside Cement Co. have been well maintained and in view of important reductions in operating costs and the expected increase in use of cement, the company's prospects for 1930 are most encouraging."

Lehigh and Alpha Plants in Illinois Reopen

The Lehigh and Alpha Portland Cement Company plants at LaSalle, Illinois, reopened during February. The Lehigh plant has been idle since November 1st and reopened on February 17th. The Alpha plant was closed on December 22nd and started work on February 1st.

Wolverine Teams Hold Annual Safety Banquet

Officers and employes attended the second annual banquet of the orange and green safety teams of the Wolverine Portland Cement Co. at Quincy, Mich., on January 30th.

Following dinner and entertainment, the first aid team of the plant gave a demonstration of correct dressing for burns.

W. E. Jacobs, of the Consumers Power Co., Jackson, Mich., was the speaker of the evening, talking on "Hazards of Electricity Both in the Plant and in the Home." He told of the safety work being done by his company, how the men are divided into 46 safety groups, each striving for silver wall plaques presented at the end of the contest to the winning groups. He commended the Quincy group on their fine work and warned them not to go "stale" on safety.

The basic cause of accidents and their prevention, he classified as the "Big Four," as follows, "First, to get the right man for the job you want to fill. Second, guard all machinery that is dangerous. You can stop only from 10 to 15 per cent of the accidents this way but by getting the right men, they will look out for themselves. Third, instruction by foremen to new men is a very big factor. And last, to have proper supervision of the men at all times."

John Dieterman was chairman of the program committee.

Regional Safety Meeting Held in Alabama

One of the first regional safety meetings of 1930 was at Birmingham, Alabama, on January 22nd. H. O. Underhill, superintendent of the Birmingham plant of the Alpha Portland Cement Company, acted as general chairman, and was assisted by A. D. Stancliffe, general superintendent of the Lone Star plants in Alabama and Louisiana, and R. H. MacFetridge, superintendent of the Lehigh plant at Birmingham.

A talk, "Good Housekeeping as a Safety Aid," prepared by the International Cement Corporation and presented by W. W. Deadman, superintendent of the Spocari, Alabama, plant of the Lone Star Cement Company, was one of the most interesting presented.

New Cement Plant in French African Colony

The newly incorporated Societe des Chaux et Ciments du Senegal, a subsidiary of the banking firm, Banque d'Etudes et d'Entreprises Mutuelles, with the co-operation of the technical staff of the Poliet and Chausson cement firm, has begun work on the erection of a cement and lime plant at Linding, near Rufisque, French Africa.

Actual construction is under way; the mechanical equipment is ready for shipment and railway embranchments are being laid by the Dakar-Saint Louis railroad.

The new plant will have an initial capacity of 30,000 tons of cement per year, all of which will be sold in the local markets.

Signal Mountain Co. Re-Elects Officers and Board

Officers and members of the board of directors of the Signal Mountain Portland Cement Company were reelected at the annual meeting on January 24th at Chattanooga, Tenn.

John L. Senior was again chosen president; Hardwick Caldwell and S. W. Storey, vice-presidents; J. P. Hoskins, treasurer, and R. L. Caskey, secretary. The board is composed of the officers and the following: F. P. Butler, D. F. McPherson, C. L. Hardwick, Fred Carter, L. L. Fischer, U. T. Trimby and R. G. Wright.

Report on Monolith Earnings in 1929

A report made at the annual meeting of the stockholders of the Monolith Portland Cement Company showed earnings for 1929 of nearly 5 times bond interest requirements, after provision for depreciation and other charges. After providing for preferred and common dividends, there was a small addition to surplus.

The stockholders were told that the company encountered adverse factors with respect to competitive conditions and the interruption of plant operations during the second half of the year, owing to the introduction of limestone loading and kiln improvements which are calculated to reduce operating expenses nearly $300,000.

Bauxite Deposit Discovered Near North Pole

As a result of researches by the Norwegian government during the past three years an important deposit of bauxite has been discovered on Jean-Mayer Island, north of the Polar circle. The deposit, which is close to a year-round accessible harbor, contains approximately 30,000,000 tons of mineral with 60 per cent of bauxite. Exploitation of this find will provide Norway with sufficient bauxite to meet all the needs of its cement and aluminum industries and close the market to bauxite from France.

Cement Notes From France

The Societe des Ciments de Verdun is building a new mill at Brieulles-sur-Meuse which will have an annual production of from 100,000 to 140,000 tons of high early strength cement.

The Societe des Cimenteries de Couzon is building a large, new addition to its mills.

Severe Weather Causes Shutdown of Lone Star, Indiana, Plant

Unusually severe weather, causing a decrease in construction work and in cement demand, with resultant overproduction, caused the shutting down of the Lone Star Cement Company, Indiana, plant at Greencastle, Indiana, on February 1st, for an indefinite period. It is expected, however, that operations will be resumed on or about March 15th.

The plant, under operation, had produced sufficient cement to fill all of its storage bins.

Cement Firms in Morocco Combine

The Societe Marocaine des Ciments Lafarge has been absorbed by the Societe des Chaux, Ciments et Materiaux de Construction du Maroc, of Morocco. The capital of the new corporation has been increased from 14,000,000 to 22,000,000 francs.

Sale of Belgian Plants

The Ciments Portland de Buda have sold their mills at Buda to the Societe de Niel-on-Rupeil in exchange for 4,000 shares of Cimenteries et Briqueteries Reunies.

Spray Process of Slurry Feed

Ideal Method of Heat Transference Is That Obtained Between Gas and Gas and Liquid and Liquid—Slurry Spraying Theory Fundamentally Sound—Description of Rigby Process—Spray Process—Power Consumption—Capital Outlay—Reduced Wear on Kiln Lining

By **S. J. M. AULD**
O.B.E., M.C., D.Sc.

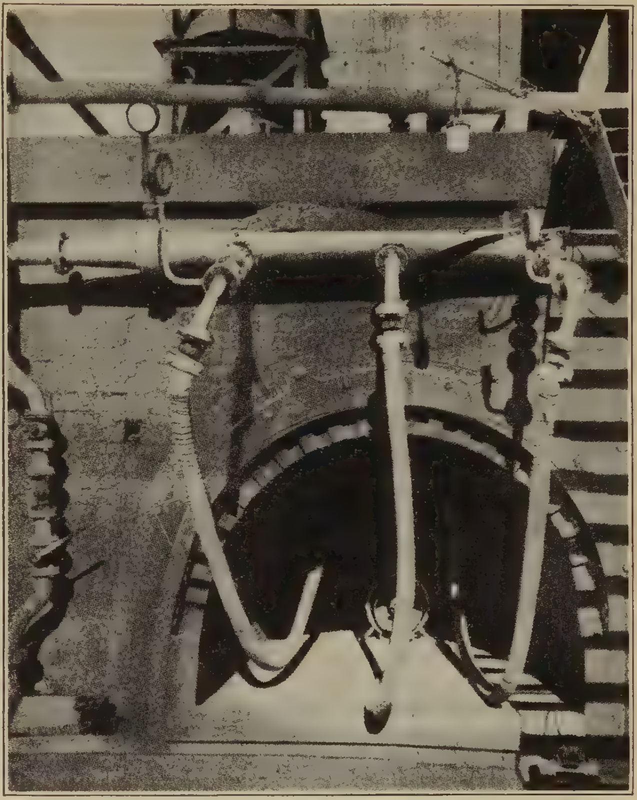
THE cement industry being largely dependent on the efficient use of fuel, it is natural that the study of heat transfer phenomena should be the basis for the design of much of its important equipment. In this matter, as reflected by fuel consumption, the change from the dry process to the wet process has been retrogressive; nevertheless, the unquestioned advantages of the wet process in facilitating intimate mixing of the slurry and the correct proportioning and control of the ingredients has so far generally outweighed other considerations as to render the dry process obsolescent. With the advent of the wet process, fuel consumption so far increased that in kilns of stated fuel capacity the reduction in ouput (with the old methods of slurry feed) can be taken to be at least 10 to 15 per cent compared with that on the dry process for the same consumption. It is small wonder, therefore, that cement manufacturers have been working at least to make good this loss by decreasing the duty of the fuel, by recuperation, and by better methods of heat transference. In the first two categories come the methods of the use of filters for the reduction of the water content of the slurry and the use of waste heat boilers.

Better Heat Transference

The matter of heat transference is rather more intricate. The evaporation of the water content of slurry and the subsequent clinkering are effected almost entirely by heat transference from gas to liquid and gas to solid. These cases are among the most difficult to follow theoretically. It can be shown, however, that better heat transference may be obtained by increasing the velocity or increasing the effective surface. In the cement industry the former may be regarded as nearly constant for each particular size of kiln with fixed fuel capacity. It therefore remains to increase the suitable area of heating surface. This is the underlying principle of all such methods as the use of lifters or chains for turning over the slurry, extra surface of which is thus exposed to the hot gases, and extra solid surface provided to take up heat from the gases and pass it on indirectly.

Such methods are only a partial solution of the problem. The ideal method of heat transference is that automatically obtained between gas and gas or miscible liquid and liquid. As between gas and solids or liquids the nearest approach to this condition of things is to be gotten by fine subdivision, and the optimum obtainable in cement making is by "atomizing" or spraying the slurry into the kiln.

The method of slurry spraying is therefore fundamentally sound, and is, indeed, nearly theoretically perfect for the type of heat transference under consideration. It has remained to develop it in such a way as to render it equally sound in practice, and this has been accomplished by the process evolved by the late Thomas Rigby and brought to a state of mechanical efficiency by the inventor and his associates.



Spray feed installation at a modern plant

Details of Rigby Process

The process and its method of use are being developed by Industrial Driers, Ltd., of London. Remarkable results have been achieved by the Rigby process, and, with earlier mechanical difficulties overcome, the process is being increasingly adopted throughout the world.

The underlying features of the Rigby process are: (a) the spraying of the slurry down the length of the kiln in counterflow to the ascending hot gases; (b) the use of directional control of the spray so that the evaporation is so far completed before the slurry touches the walls that there is little or no adherence, and therefore a reduced tendency to build up slurry rings; and (c) the use of a slurry lute in the smoke chamber for the collection of dried or partially dried slurry deposited from the spray or carried over from the kiln.

Not only is the trouble from slurry rings minimized

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and in most cases entirely obviated, but the dry meal and the clinker are generally of smaller size than those produced from the same materials by part methods, the clinker at one works on test with the process being reduced to a coarse powder with about 80 per cent capable of passing an ⅛-in. screen.

Efficient Evaporation

The process can be varied slightly according to the nature of the slurry and the size of the kiln, but as a rule two cones of spray are produced, the direction of which can be adjusted and the relative pressure modified so as to give interlacing zones distributed along the kiln, thus effectively interposing a double barrage of slurry spray across the path of the hot gases. When a single spray is used it is adjusted, as regards spread and distance from the kiln-mouth, to produce as effective a spray screen as possible. When the double spray is employed the pressure on one jet is kept around 70 lbs. per sq. in. and the other a few pounds less. By these means the most intimate contact is obtained between slurry and hot gases, and evaporation proceeds efficiently. At the same time the slurry spray arrests and washes down dust which would otherwise be carried out through the stack, and in this way mitigates the dust nuisance.

In practice the slurry is passed through a Clarke separator or similar device to insure efficient removal of large particles which might interfere with the proper flow of the slurry or the shape and direction of the sprays. The cleaned slurry is then delivered by suitable pumps through strong flex to the nozzles. Ram pumps are generally used for the purpose, but there is no reason why centrifugal pumps should not be employed, and in one or two works where the process has been recently installed this is being done with good results.

Feed Pressure Regulation

Experience has shown that the feed pressure is best hand-governed by a pressure-control valve, excess slurry being returned either to the feed tank or the main slurry tank. The nozzles are mounted in a steel plate forming part of a housing projecting from the anterior wall of the smoke chamber, the slurry being sprayed as a rule across a part of the passage conveying the gases from the cold end of the kiln. The nozzles are of simple construction without moving parts and require very little attention, the only parts which wear out being the tips and to a lesser extent the spiral guides which may be employed to give direction and a rotary motion to the spray.

The nozzle tips can be made of various materials. Mild steel, case hardened, is largely used and this lasts on an average 70 hours. White cast iron is also extensively employed, particularly on the Continent where it is regarded more favorably than case-hardened mild steel, and such tips are claimed by several works to last 100 to 120 hours. In the United Kingdom one firm uses a specially hard proprietary steel, and these tips last at least 300 hours. The cost of the tips is inconsiderable and replacement can be made in a minute or two, so that there is no stoppage of the kiln or interference with output. The tips are replaced, or may be bushed, when observation indicates that wear has proceeded sufficiently to cause the spray to waver in its course when issuing from the jet. The spiral guides need only be replaced every two or three months, and other parts of the nozzle last indefinitely.

The chief advantages of the Rigby spray-feed process are claimed to be increased output or decreased fuel consumption, or both, and it is on this basis that claims for its revolutionary character are based. The actual extent of fuel economy or increased output depends on such factors as the nature and the water-content of the slurry, the calorific value and efficiency of combustion of the fuel, the size and nature of construction of the kiln, etc. Estimation of the benefit to be anticipated can therefore only be made for each individual case as a result of consideration of the existing conditions of operation.

Reduction in Fuel Used

In practice the reduction in coal consumption, calculated per unit weight of cement, varies as a rule from 15 to 20 per cent, and the increased output per kiln from 20 to 30 per cent. In the following cases, taken from a list of works operating the process, the results achieved have been as follows:

Works	Country	Water content of slurry Per cent	Reduction of fuel consumption Per cent	Increased output per kiln Per cent
A	United Kingdom	40	20	25 to 30
B	Belgium	42-43	20	25
C	Scandinavia	38	—	23 to 27
D	Poland	37	—	25
E	Australia	40	—	19

These results support the claims made for the outstanding nature of the spray process. Further, the operating and maintenance costs are low and do not appreciably affect the net savings. As regards maintenance, the only working parts likely to suffer wear apart from ordinary depreciation are the nozzle tips and guides already mentioned, and the slow wear from abrasion of the perforated separator plates and pump packings, the cost of replacement of which is negligible. The total maintenance costs are stated to be less than one-twentieth of a penny per barrel of cement.

It is not necessary to employ extra labor, the kiln men being capable of operating the process as part of their routine. It is, of course, advantageous to put control of the atomizing in the hands of one man, who, however, can perform other duties.

Capital Outlay

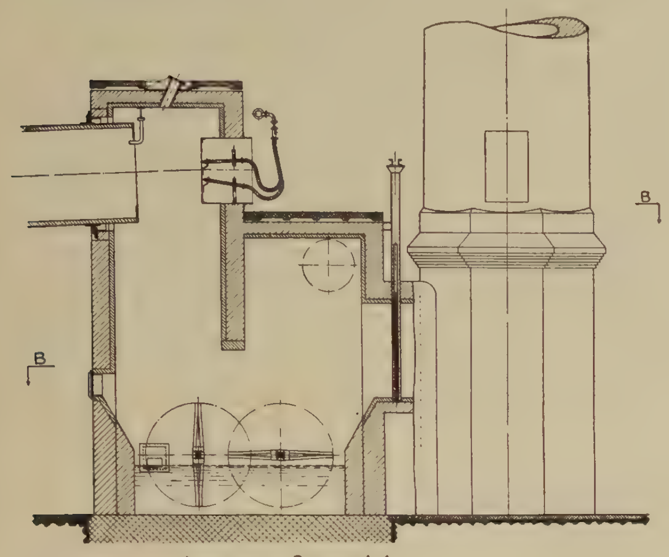
In the case of new plants the capital cost is inconsiderable. For existing plants the modification of the smoke chamber forms the largest outlay, consisting of minor structural alterations to permit of the installation of the spraying assembly and the deflection of the kiln gases over the slurry lute, and the installation of a fan to make up for the loss of draught occasioned by the cooling of the exit gases in the spray process. The cost of structural alteration varies with each installation, but is seldom more than a few hundred pounds. This, of course, does not include new plant, i. e., atomizing and paddle gear, fan, and motor.

The size of the fan is calculated for each individual case, but it should be pointed out that the fan duty is to make up for the drop in temperature, there being little or no resistance from the spray to the flow of gases. Powerful fans such as are used for waste heat boilers are not needed. The temperature of the exit gases measured at the entrance to the smoke chamber is considerably reduced by the spray process, generally by 200 deg. C. to 250 deg. C., but owing to the difficulty of obtaining strictly comparable observations the actual temperature is not a good criterion of the efficiency of operation.

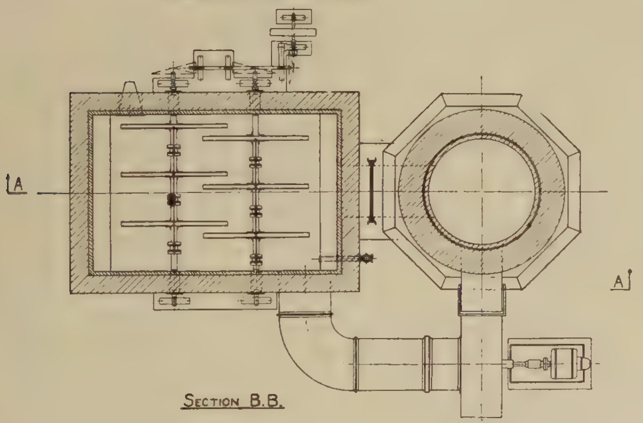
Action of Slurry Lute

The slurry lute, which is an important feature of the Industrial Driers spray installations, is also covered by world-wide patents. It consists essentially of a volume of slurry in the bottom of the smoke chamber, kept agitated by paddles set in counter rotation, and combined with means for the deflection of the kiln exit gases over its surface. By this means all deposits from the jets and any dust carried away from the kiln are washed down into the slurry, which passes continually over a constant-level weir and is thence conveyed to the slurry tank or direct to the kiln for re-use.

The slurry lute is of particular value when powdery raw materials are employed. It practically eliminates the dust trouble arising from the use of rotary kilns, and as such is of vital importance in reducing loss and ameliorating conditions where accumulation of flue dust or its distribution over the neighboring country constitutes a nuisance. In very severe cases arrangements are also made for spraying slurry into the smoke chamber, but it is only in rare instances that this added washing has been found necessary.



Longitudinal Section A A.



Section B.B.

Arrangement of spray slurry device for rotary kiln

Spray Process Power Consumption

On this basis it is possible to sum up the power consumption for an average works using the spray process, though it will naturally vary with the size of the plant. About 15 h.p. is required for the ramp pumps, 6 h.p. for the paddles, 15 h.p. for the fan, and 2 h.p. for the separator when used. With power at one halfpenny per unit the total operating and maintenance charges come well under 2d. per ton. The saving in fuel alone is very considerable. The reduction of operating costs has in itself been sufficient to induce certain cement manufacturers to make the change, while to others the chief attraction has been the possibility of increasing output with limited expenditure since it is possible readily to modernize existing rotary kilns by the use of this method. In new works designed for a given capacity the length of the kiln could be considerably shorter with the atomizing process than with the older feed methods. This not only lowers capital charges by reducing the length and height of the kiln houses, but effects saving in the power required for rotating the kiln. On an average kiln it is claimed the length could be reduced by approximately 20 per cent.

As compared with the use of chains alone the spraying process is claimed to give much better heat transference and to allay the dust trouble.

Reduced Wear on Kiln Lining

A great additional advantage to the spray process is the reduced wear on the kiln lining. In one case the life of the kiln lining has been increased over five times by its introduction, and this saving alone is regarded as sufficient to repay the cost of installation.

The illustrations show a diagrammatic layout of a spray installation and a photograph taken from modern works where all three kilns are working with the Rigby spray feed process.

Petoskey Re-elects John, Buckbee, Lucas as Directors

J. B. John, J. C. Buckbee, and H. H. Lucas were re-elected as directors for a term of five years each at the annual meeting of stockholders of the Petoskey Portland Cement Company, held January 22nd, at Newaygo, Mich.

A report showed the book value of the company stock to be approximately $13.50 per share, par value being $10.00. Net profits for the year ending December 31, 1929, were given as approximately $262,000, an increase of $56,000 over the previous year.

Mr. John was re-elected as president of the company at the directors' meeting.

Final Outcome of Tariff Bill Up to Joint Committee

A tariff on cement having been looked upon with disfavor by the Senate on January 31st, when the product was restored to the free list by a vote of 40 to 35, the final outcome is now up to a joint committee.

The bill as passed by the house places the tariff at 31 cents a barrel, and the joint committee, comprised of members of both houses, will reach a compromise.

Kingsport Plant Due to Reopen in March

The Pennsylvania-Dixie Cement Corp. plant at Kingsport, Tenn., was scheduled to resume operations on March 1st, after being closed down for nearly a year.

Equipment modernization has been under way in the meantime.

Safety Congress at Pittsburgh in September

The 19th annual Congress of the National Safety Council will be held at Pittsburgh, Pennsylvania, September 29th to October 4th. Headquarters will be at the William Penn Hotel.

Cement Statistics for January

Production and Shipments Show Decreases—Stocks Slightly Higher

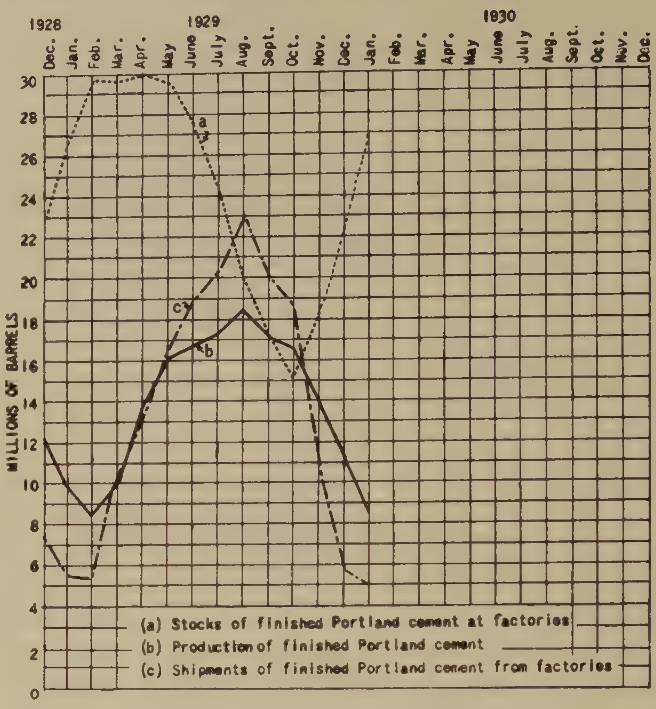
Relation of Production to Capacity

(Figures represent per cent)

	—January— 1929	1930	Dec. 1929	Nov. 1929	Oct. 1929
The month	**46.5**	38.8	51.5	66.6	77.0
The 12 months ended	**71.0**	65.5	66.4	66.8	67.3

NOTE: IN ORDER THAT THE READER MAY KNOW THE TREND AT A GLANCE, THE HIGHER FIGURE, WHETHER FOR EITHER YEAR, UNDER ANY CLASSIFICATION, APPEARS IN SLIGHTLY HEAVIER TYPE.

	1929	1930	Increase or Decrease, Per Cent
Production, January	**9,881,000**	8,498,000	—14.0
Shipments, January	**5,707,000**	4,955,000	—13.2
Stocks at end of January	26,797,000	**27,094,000**	1.1
Total production for year	(Same as first item)		
Total shipments for year	(Same as first item)		
No. of plants reporting	160	165	



Production, Shipments and Stocks of Finished Portland Cement, by Districts, in January, 1929 and 1930, and Stocks in December, 1929

District	Production—January 1929	1930	Shipments—January 1929	1930	Stocks at end of month 1929	1930	Stocks at end of December, 1929*
Eastern Pa., N. J., and Md.	**2,410,000**	2,286,000	1,387,000	**1,388,000**	**6,087,000**	6,075,000	5,177,000
New York and Maine	**405,000**	320,000	**257,000**	249,000	**1,804,000**	1,626,000	1,555,000
Ohio, Western Pa., and W. Va.	**818,000**	727,000	430,000	**472,000**	3,224,000	**3,289,000**	3,035,000
Michigan	**703,000**	346,000	**266,000**	234,000	2,435,000	**2,516,000**	2,403,000
Wis., Ill., Ind., and Ky.	1,047,000	**1,377,000**	313,000	**327,000**	3,423,000	**3,926,000**	2,876,000
Va., Tenn., Ala., Ga., Fla., and La.	**884,000**	842,000	**824,000**	730,000	**1,955,000**	1,753,000	1,641,000
Eastern Mo., Ia., Minn., and S. Dak.	**1,198,000**	758,000	189,000	**214,000**	**3,891,000**	3,140,000	2,595,000
W. Mo., Neb., Kans., Okla., and Ark.	614,000	**701,000**	**349,000**	271,000	1,610,000	**1,886,000**	1,456,000
Texas	**466,000**	321,000	**458,000**	317,000	530,000	**817,000**	813,000
Colo., Mont., Utah, Wyo. and Idaho	**50,000**	....	**61,000**	42,000	**524,000**	413,000	456,000
California	**1,034,000**	718,000	**1,033,000**	640,000	785,000	**1,168,000**	1,090,000
Oregon and Washington	**252,000**	102,000	**140,000**	71,000	**529,000**	485,000	453,000
	9,881,000	8,498,000	5,707,000	4,955,000	26,797,000	27,094,000	23,550,000

Production, Shipments and Stocks of Finished Portland Cement, by Months, in 1929 and 1930

Month	1929—Production	—1930	1929—Shipments	—1929	Stocks at end of month 1929	1930
January	**9,881,000**	8,498,000	**5,707,000**	4,955,000	26,797,000	**27,094,000**
February	8,522,000	....	5,448,000	....	29,870,000	....
March	9,969,000	....	10,113,000	....	29,724,000	....
April	13,750,000	....	13,325,000	....	30,151,000	....
May	16,151,000	....	16,706,000	....	29,624,000	....
June	16,803,000	....	18,949,000	....	27,505,000	....
July	17,315,000	....	20,319,000	....	24,525,000	....
August	18,585,000	....	23,052,000	....	20,056,000	....
September	17,223,000	....	19,950,000	....	17,325,000	....
October	16,731,000	....	18,695,000	....	15,381,000	....
November	14,053,000	....	11,222,000	....	18,213,000	....
December	11,215,000	....	*5,951,000	....	23,550,000	....
	170,198,000	....	*169,437,000	....	....	....

*Revised.

MEN and MILLS

Notes from the Field

Frank Guy Universal Traffic Manager; Randolph is Assistant

Frank E. Guy has been appointed traffic manager of the Universal Atlas Cement Company, Chicago, it was announced recently. He was formerly eastern traffic manager, located at Pittsburgh, for the Universal Portland Cement Co. Mr. Guy's headquarters will be at Chicago.

W. E. Randolph has been appointed as assistant traffic manager with headquarters at Pittsburgh. Mr. Randolph has been with Universal for 22 years and was assistant to Mr. Guy when the latter held his previous position.

Affleck Announces New Universal Atlas Appointments

New appointments in the Universal Atlas Cement Company, a subsidiary of the United States Steel Corporation, were announced on February 20th by B. F. Affleck, president.

E. D. Barry, superintendent of the plant at Universal, Pa., is appointed assistant operating manager with offices in Chicago. He has been connected with Universal for more than 25 years.

Leonard Wesson, assistant general superintendent, Atlas division, is appointed assistant operating manager with headquarters in Chicago. In his new position Mr. Wesson will return to familiar ground as he was formerly a member of the Universal organization. He has had more than 20 years' experience in the cement industry.

J. C. Witt, chemical engineer, is transferred from the Buffington, Ind., plant to Chicago. For three years he was engaged in chemical research for the Portland Cement Association and is the author of articles on the subject. Mr. Witt has been with Universal since 1924.

T. A. Hicks, general chemist, Atlas division, is appointed to the same position with the new company, with offices in Chicago. For many years Mr. Hicks was associated with the Atlas company.

R. L. Slocum who hitherto was assistant superintendent at the Universal, Pa., plant is made superintendent. Last year he was awarded the Judge Gary medal for 25 years' continuous service.

H. H. Lauer, engineer, Atlas division, who is appointed assistant chief engineer, Chicago, has been with the Atlas company several years. Previously he was connected with the Illinois Steel Company and related industries and has had extensive experience in the engineering field.

Electrical Engineer for Universal Atlas Dies

J. H. Lendi, electrical engineer for the Universal Atlas Cement Company, died at his home at Chicago on January 18th. He had been in failing health for the past year and able to devote only a part of his time to his work.

Following broad experience in electrical engineering, he joined Universal Atlas in 1910.

How Baumberger's "Head Figuring" Put Him in Cement Business

"Southwestern Resources," in a recent article on the San Antonio Portland Cement Company and its beginning, narrates the following incident:

"In 1880, there was a 'Cheap John' store on the west side of Military Plaza, near Kalteyer's on the north side. One young man there was bookkeeper, salesman, delivery man for the 'two Jews' who ran the store. His name was Charles Baumberger. Dr. Kalteyer (one of the founders of the San Antonio Cement Company's predecessors) knew him as a patron and a prompt payer of his small monthly account. Baumberger was getting $40.00 per month at the Cheap John and Dr. Kalteyer, after much inquiry about what he knew about 'figuring' offered Baumberger a joint job with the drugstore and the cement business at $40.00 per month, which he accepted.

"Baumberger came to his new job on October 28, 1880, in time to figure the amounts of the payroll. He made up the first payroll under the watchful eyes of the Doctor and Secretary Mauermann, and he figured so fast that the two thought he was bluffing and took the payroll into another room and after taking an hour to figure on paper what Baumberger had figured 'out of his head' in ten minutes, and finding the sums correct, then and there entered in the cement manufacturing business a man, who in years to come, was to create one of the largest manufacturing businesses in Texas."

Meisnest Sales Manager of Pacific Coast Cement

Darwin Meisnest has been appointed sales manager of the Pacific Coast Cement Company, N. D. Moore, vice-president, has announced. His headquarters will be as in the past, at 617 Smith Tower, Seattle, Washington.

San Antonio Engineers Visit Republic Plant

The San Antonio Engineers' Club, San Antonio, Texas, following their regular weekly luncheon meeting, on January 28th inspected the Republic Portland Cement Company plant at Longhorn.

Berns Heads C. A. C. Advertising Council

Max A. Berns, publicity manager of the Universal Atlas Cement Company, was on January 27 re-elected chairman of the Advertising Council of the Chicago Association of Commerce.

Gordon Huth Safety Director for Universal Atlas

Rising from a machinist's helper in 1915, when he was 19 years old, to safety director at 33, for a large cement company, is the experience of Gordon Huth of Duluth, who on February 10th was appointed safety director for the Universal Atlas Cement Company.

Mr. Huth has been connected with the company for about 15 years, during 11 of which he has been safety inspector at Duluth. In his new position he will have his headquarters in Chicago.

Advance announcement of Mr. Huth's appointment was made on February 5th at the monthly safety meeting of the Industrial Safety Committee of the Duluth Chamber of Commerce of which he was chairman. At that time a message was read from Mr. Affleck, congratulating Duluth on the progress it had made in industrial safety and announcing the appointment of Mr. Huth to his new position.

"In three different years," reported Mr. Affleck, "the Duluth plant has won safety trophies for operating a year without a disabling accident. In one of these years it was the only cement plant in the United States to do this. This year it celebrated two years' continuous operation without an accident."

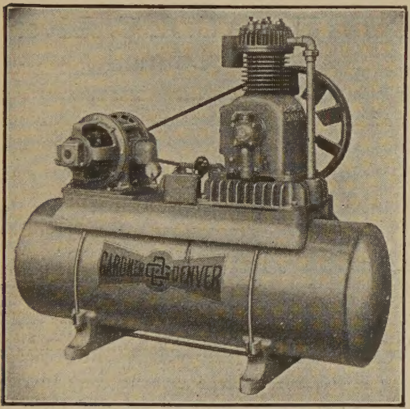
Mill Equipment

Gardner-Denver Has New Air-Cooled Compressor

A new model air-cooled single stage compressor has just been placed on the market by the Gardner-Denver Co., of Quincy, Ill. This is to be known as the A-C-E Model. It consists of a 3½ by 4 duplex compressor and a 5 h.p. motor mounted on a cast iron base on top of the air receivers. The unit has a displacement of 26 cu. ft. per minute, operating at a rate of 600 revolutions per minute. This rate can be reduced and altered to fit the particular circumstances.

Manufacturer's specifications follow:

An outstanding feature is the enclosing of the suction and discharge valves in separate compartments. The valves are special, heat treated and ground steel discs. The use of the compartments prevents the air from being heated when passing through the intake valves.



An automatic or hand operated start and stop control is furnished as standard equipment and operated in conjunction with the Penn type pressure and moisture unloader. The unloader is set to cut in at 130 lbs. and out at 165 lbs. Continuous operation is assured by this control.

Lubrication for the compressor is by the controlled splash type. A positive driven plunger pump on the outside of the crankcase feeds filtered oil to the troughs under the connecting rods. A special oil ring and groove on the piston prevents oil from passing over to the discharge lines. An oil level gives positive indication of the amount of oil in the reservoir.

Two New Low Density Explosives

E. I. du Pont de Nemours & Company, Wilmington, Delaware, announces that the Eastern Laboratory has recently developed two new low density gelatin explosives which will be marketed under the names of Gelex No. 1 and Gelex No. 2.

These new products are intended for use in ore mines and for the underground mining of limestone and other nonmetallic minerals. Both Gelex No. 1 and Gelex No. 2 are said to be extremely cohesive and plastic, so that they will load well in upward pointing holes.

Centrifugal Vibrating Screens With One or More Decks

The Allis-Chalmers Mfg. Co.,* Milwaukee, Wis., has designed and introduced the Centrifugal Vibrating Screen for sizing various materials.

The vibrating motion is mechanically produced and transmitted to the screen body so that it is equal over the entire screen surface; resulting in maximum capacity under all conditions, according to the manufacturer.

The screen is of rugged construction, and has self-aligning anti-friction roller type bearings, it is stated. The angle of the screening surfaces can be easily adjusted to suit operating conditions.

Allis-Chalmers enclosed fan cooled squirrel cage motors with anti-friction bearings are used for driving these screens through Texrope drives.

Anemo Tachometer Measures Air Velocity

Announcement of a new instrument, coming from the O. Zernickow Company, New York City, concerns the O-Z Anemo Tachometer, an air velocity meter. The device shows instantaneously the air velocity of pumps, blowers, etc., and its fluctuations in miles per hour and meters per second, according to the manufacturer.

All parts are enclosed in a fully dust proof aluminum housing, it is stated. The cross cups are protected by a wire guard.

The legible dial has double graduation, from 10 to 70 miles per hour and 5 to 35 meters per second.

New Standardized Elevator Drive

A new standardized drive for elevators has just been announced by H. W. Caldwell & Son Company of Chicago.

This drive is said to be compact, efficient and positively quiet at all speeds. It is built to operate centrifugal discharge, perfect discharge or continuous bucket elevators requiring 3 to 15 h.p. The entire line is standardized and carried in stock.

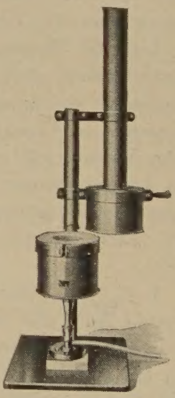
The first reduction of the drive is made up of a ruggedly built fully enclosed worm gear speed reducer to which a motor is coupled. The motor and the worm reducer are accurately aligned on a welded steel base, making a compact assembly easily supported on the elevator casing or platform.

The second reduction in speed is made by a Link-Belt roller chain drive, which also acts as a flexible connection between the reducer shaft and head shaft.

Compact Gas-Fired Laboratory Furnace

A new gas-fired laboratory furnace said by the maker to possess several novel features and useful operating characteristics has been placed on the market by the Babcock & Wilcox Company.

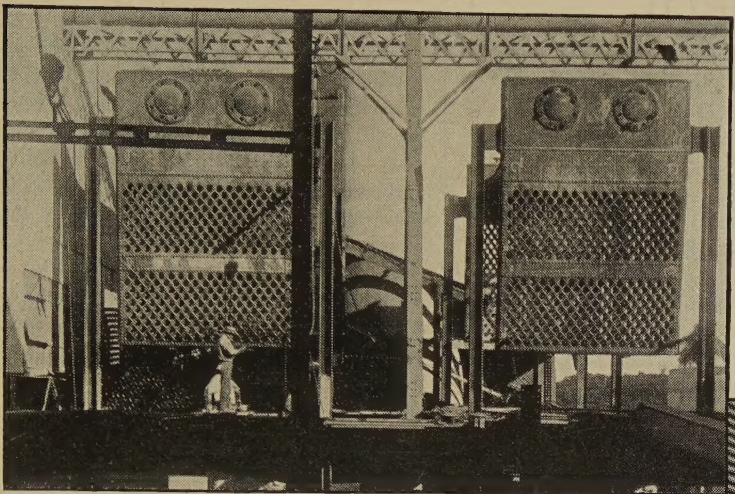
The furnace is fitted with an atmospheric burner which requires no auxiliary equipment, and can be left to burn unattended with safety. It will maintain a uniform temperature over long periods, and if fitted with the usual gas pressure regulator will maintain a temperature of plus or minus ten degrees F. for several days.



It is claimed that this furnace can be brought up to working temperature very quickly. Tests conducted by the industrial research division of Massachusetts Institute of Technology show the furnace to be capable of being brought from room temperature to 2,500 deg. F. in about 30 minutes, and to 2,000 deg. F. in approximately 15 minutes. The maximum temperature is somewhat over 2,600 deg. F. using ordinary manufacturing illuminating gas under the usual 3-in. (water gauge) pressure.

The maker states that these time-temperature operating characteristics are due to the use of proper gas velocities in the furnace, the stack proportions, a unique baffling arrangement, and the use of the new B. & W. No. 80 refractory insulator lining which has an extremely low heat conductivity.

. . . Cuban Mill Again Installs Edge Moor Waste Heat Boilers

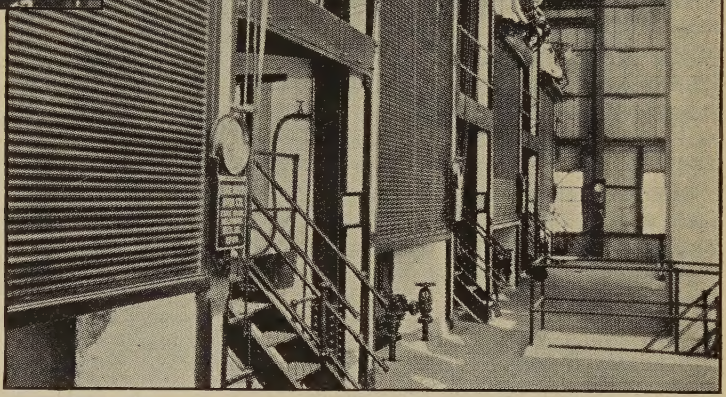


1929

Cuban Portland Cement Company installed two more 842 h.p. Edge Moor Waste Heat Boilers shown above during erection.

1925

Cuban Portland Cement Company installed four 842 h.p. Edge Moor Waste Heat Boilers, shown below.



In 1925 the Cuban Portland Cement Company purchased for its mill at Mariel, Cuba, four 842 h.p. Edge Moor Waste Heat Boilers with complete auxiliary equipment, all furnished by this company.

When the capacity of the Mariel mill was increased in 1929, the savings effected by this waste heat plant resulted in a second order for two additional Edge Moor Boilers of the same size and type.

The Cuban Portland Cement Company is controlled by the International Cement Corporation. Other International mills at Hudson, N. Y., and in Argentina are also successfully operating Edge Moor Waste Heat Systems.

More than 70 per cent of the waste heat boiler horsepower installed in the cement industry throughout the world is Edge Moor-built. Edge Moor engineers are ready to help you to reduce your power costs.

EDGE MOOR IRON COMPANY *Established 1868* EDGE MOOR, DELAWARE
New York *Chicago* *St. Paul* *Charlotte* *Los Angeles*

EDGE MOOR
Water Tube BOILERS
STRAIGHT AND BENT TUBE TYPES—WATER WALLS—AIR PREHEATERS

EDGE MOOR BOILERS EDGE MOOR, DEL. U.S.A.

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With the Manufacturers

NOTES FROM THE FIELD

Hercules Is New Delaware Shipping Point

Hercules, Delaware, is the name of a new shipping point for freight forwarding and receiving, to be used by the *Hercules Powder Company*, Wilmington, Delaware.

The new station is on the Landenburg branch of the B. & O. Railroad and is marked by a special sidetrack to the new experimental station being constructed by the company. Hercules, Delaware, is about five miles from Wilmington and is a freight station only.

Haynes Stellite Appointments

At a recent directors' meeting of the *Haynes Stellite Company*, unit of Union Carbide and Carbon Corporation, *E. E. LeVan* was appointed general sales manager and *J. H. Maguire* was appointed works manager.

Other appointments were *F. T. McCurdy*, plant superintendent; *J. R. Brown, F. L. Secord* and *Everett Page*, assistants to superintendent; *L. H. Brown*, research engineer.

Fertig Research Director

George J. Fertig has been appointed director of research and chemical and physical laboratories in the southern district, by the *Pittsburgh Testing Laboratory*, Pittsburgh, Pa.

James Cleary, Sales Manager

James Cleary has been appointed general sales manager of *Combustion Engineering Corporation*, New York. Mr. Cleary joined the organization in 1921 and has served successively as district manager at Philadelphia and Detroit, assistant general sales manager, and western manager with offices at Chicago.

Du Pont Annual Meeting

The fourteenth annual meeting of the technical section of the explosives department, *E. I. du Pont de Nemours & Company*, was held at Wilmington, Del., February 4th, 5th and 6th. *Arthur LaMotte*, manager of the section, presided. More than one hundred subjects relating to explosives and their uses in mining, construction and for other industrial purposes were discussed by the eighty du Pont executives and field representatives from all parts of the United States.

Overnight Service on Chain Drives

Silent chain drives have been stocked by *Link-Belt Company* distributors for 6 years. The latest extension of this power transmission service is the "stocking" of Link-Belt roller chain drives (the two wheels and the chain) by local distributors, on about the same basis.

To enable chain users to take fullest advantage of this service, Link-Belt has further prepared an entirely new data book on Roller Chain, which contains engineering information and tables that enable the user to select the correct drive for his particular purpose, figure the price, and order the drive from a distributor or dealer for immediate delivery.

Ferguson Opens Chicago Office

The H. K. Ferguson Company, industrial engineers, with headquarters in Cleveland, announces the establishment of a branch office in the McGraw-Hill Building, 520 N. Michigan Boulevard, Chicago.

Henry Maag, for ten years a member of the Ferguson organization, has been appointed branch manager.

C-H Detroit Office

Effective since February 10th, the Detroit district sales office of *Cutler-Hammer, Inc.*, has been located at 2755 East Grand Boulevard, Detroit, Michigan.

The new location includes warehouse facilities where stocks of standard C-H motor control, wiring devices, safety switches and other C-H products will be carried for immediate delivery.

Gardner-Denver News

The following are recent personnel activities of the Gardner-Denver Co.:

E. F. Schaefer, vice-president in charge of sales, has just finished a trip through the northwest visiting the various branch offices. J. R. Farrell has been transferred from the St. Louis office to the Tulsa office as rock drill representative. E. H. Diamonds, formerly of the Andrews and George Co., agents in Japan, is associated with the San Francisco office as rock drill salesman.

Link-Belt Opens Vancouver Office

Link-Belt Limited recently opened a branch office in the Standard Bank Building, 510 West Hastings St., Vancouver, and their engineer, *Frank B. Wetherill*, is in charge.

Mr. Wetherill joined the Link-Belt organization 15 years ago, and for a number of years has been manager of the company's office and warehouse in Portland, Ore. He is versed in the application of materials handling and power transmitting machinery to the needs of industry in the Pacific Northwest.

In establishing this new office, it is aimed to supplement the service which has been rendered through Fleck Bros., Ltd., Canadian Fairbanks-Morse Co., Ltd., and A. R. Williams Machinery Co., Ltd., who, of course, will continue as official distributors of Link-Belt chain and other merchandise material.

Industrial Literature

Blasting Article

"*Tunnel Blasting in Quarries*" is the subject of the "*Explosives Service Bulletin*" for January, published by *E. I. du Pont de Nemours & Company, Inc.*, Wilmington, Del. This is an article by *S. R. Russell*, technical representative, and tells when and how the method can be used most successfully.

Tube Mill and Crusher Units

The Kennedy-Van Saun Manufacturing & Engineering Corporation, New York City, has published recently a 4-page folder on its worm driven air-swept tube mill. The claims made for this unit are that it involves no high maintenance cost, no breakdowns, no smoke, and so forth.

Another unit also described is the Kennedy slugger roll coal or shale crusher, for breaking down to three-quarter inch and finer.

Advice on Motor Control Selection

"*Practical Pointers on the Selection of Motor Control*" is the title of a publication just issued by Cutler-Hammer, Inc., Milwaukee, Wisconsin.

As indicated by the title, the booklet stresses in particular the features to consider when selecting motor control. It tells how to choose control to suit the motor's load, and how to select control for direct current motors and also alternating current motors. All is written by an electrical engineer in a practical and unbiased manner.